Results of forest insect and disease surveys in the NORTHEASTERN REGION of Ontario, 1991

CARRIED OUT BY THE GREAT LAKES FORESTRY CENTRE IN COOPERATION WITH THE ONTARIO MINISTRY OF NATURAL RESOURCES

D.C. Constable, T. Bouwmeester, W.A. Ingram and S. Melbourne

Miscellaneous Report No. 113

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FORESTRY CANADA, ONTARIO REGION

Ontario Region is one of six regional establishments located across Canada and operated by Forestry Canada. The overall objective of Forestry Canada is to promote the preservation, enhancement and wise use of a healthy, attractive and bountiful forest resource and terrestrial environment for the economic and social benefit of all Canadians. Ontario Region pursues this objective by conducting two major programs: research and technical services and forestry development. Both programs address major problems affecting forest management and the forest environment primarily in Ontario, but because of the transprovincial nature of the forest resource, many elements of our research program are of national significance.

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It is recognized that forested land must be managed in the best public interest, not only for the wood production essential to our economy, but also for the recreational purposes that are so important to our social well-being. This must be achieved in a manner that will maintain or improve the quality of the forest environment and preserve it for generations to come.

RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE NORTHEASTERN REGION OF ONTARIO 1991

Forest Districts:
Wawa, Sault Ste. Marie, Blind River, Espanola,
Sudbury, Temagami and North Bay

D.C. Constable, T. Bouwmeester,
W.A. Ingram and S. Melbourne

FORESTRY CANADA
ONTARIO REGION
GREAT LAKES FORESTRY CENTRE

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SURVEY HIGHLIGHTS

This report describes the status of the more important insect and disease conditions that affected forests in the Northeastern Region of Ontario in 1991, as determined from ground and aerial surveys.

Forest tent caterpillar populations continued to collapse within the region, with the gross area of moderate-to-severe defoliation decreasing by 795,247 ha. Declines occurred in six districts despite an increase of 347,734 ha in Wawa District. After a period of 5 years of no significant defoliation, large populations of the spruce budworm occurred in the region. A total of 41,796 ha of moderate-to-severe defoliation was mapped, with 41,716 ha of occurring in Wawa district and the remainder in the Sudbury and North Bay districts. A total of 9,808 ha of moderate-to-severe defoliation by the jack pine budworm was aerially mapped in parts of the Sudbury, Espanola and North Bay districts. In Sudbury District, 385 ha of moderate-to-severe defoliation by the gypsy moth was reported for the first time in the region, as well as 56 ha of defoliation in Espanola District. A total of 257,750 ha of moderate-to-severe defoliation by the birch skeletonizer was mapped across the region, the majority in the Wawa and Temagami districts.

High population levels of the white pine weevil were recorded in several districts, with leader damage as high as 26%. For the third year, large populations of the redheaded pine sawfly occurred in several townships of Espanola District. Control measures were conducted in Espanola district by Ontario Ministry of Natural Resources (OMNR) and E.B. Eddy personnel.

The 25-tree sugar maple plots, North American Maple Project plots, Acid Rain National Early Warning System (ARNEWS) plots, and a white birch health plot were all revisited. Two jack pine and one white pine seed orchards were monitored for specific insects and diseases twice during the field season. Routine visits were also carried out at the Thessalon Tree Nursery.

In this report, the following categories are used to describe the importance of insects or diseases:

Major Insects / Diseases

capable of causing serious injury to or death of living trees or shrubs

Minor Insects / Diseases

capable of causing sporadic or localized injury but not usually a serious threat to living trees or shrubs

(cont'd)

Other Forest Insects / Diseases (Tables)

These tables provide information on two types of pest:

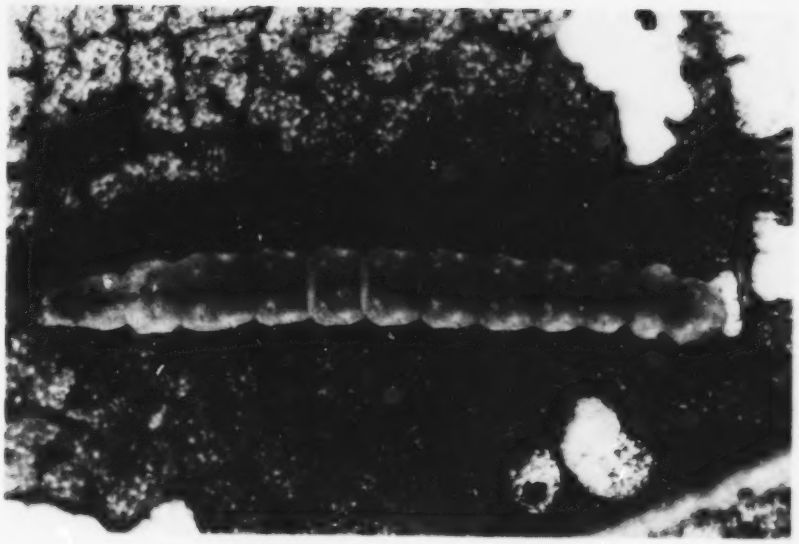
1) those that are of minor importance and have not been known to cause serious damage to forest trees, and
2) those that are capable of causing serious damage but, because of small populations or for other reasons, did not cause serious damage in 1991.

Districts affected by specific insects or diseases are listed beneath the names of those insects or diseases in the table of contents.

The authors express their appreciation to personnel of OMNR and various wood-using industries for their cooperation during the 1991 field season.

D.C. Constable
T. Bouwmeester
W.A. Ingram
S. Melbourne

Frontispiece



Birch skeletonizer, *Bucculatrix canadensisella* Cham., larva feeding on underside of white birch (*Betula papyrifera* Marsh.) leaf

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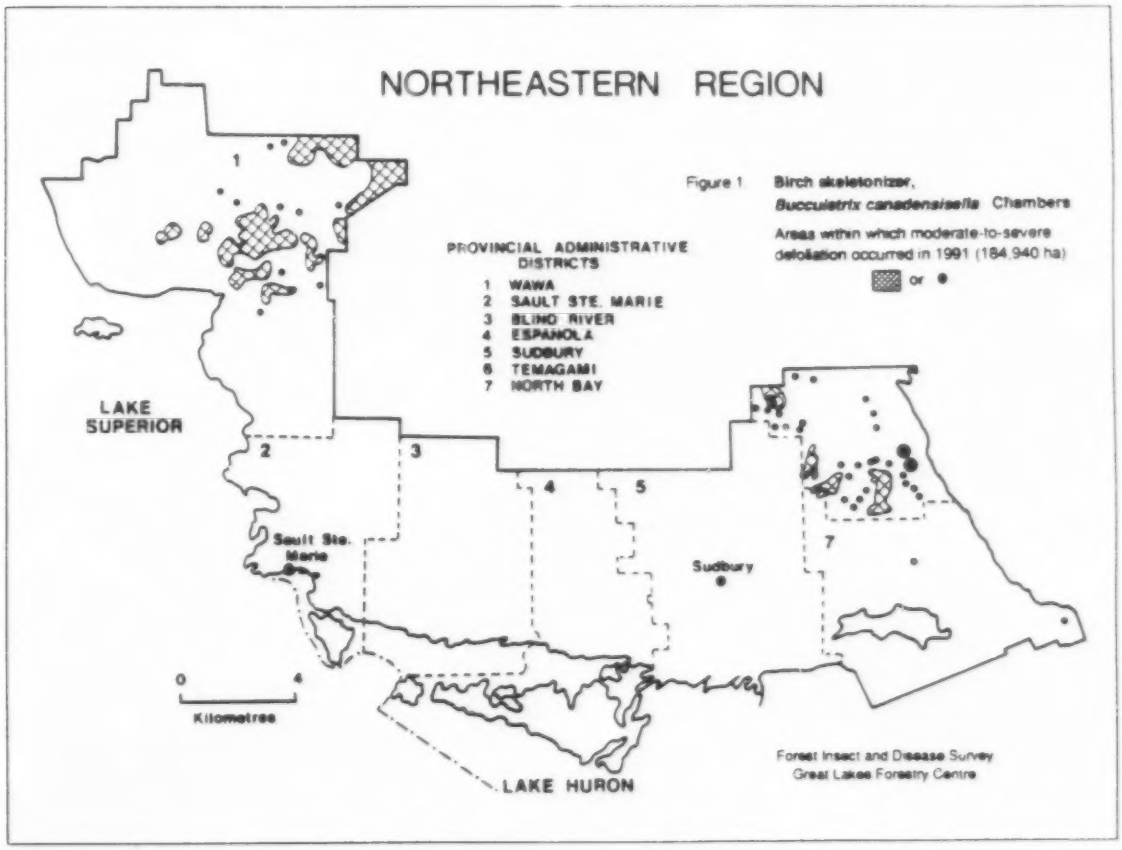
INSECTS

Major Insects

Birch Skeletonizer,
Bucculatrix canadensisella Cham.

Moderate-to-severe (75 to 100%) skeletonizing of white birch (*Betula papyrifera* Marsh.) foliage occurred at many locations in Wawa District. A total of 184,940 ha of damage was aerially mapped (Fig. 1), with pockets ranging from 40 to 58,530 ha. The largest pocket (58,530 ha) occurred in the Dubreuilville area through parts of Chenard and Huotari townships, extending south to Menzies and Musquash townships and east to Bird Township. Two large pockets, comprising 34,450 and 47,455 ha, were also mapped along the Wawa and Chapleau boundaries in the northeastern part of the district and on the northern boundary in Hook, Mildred, Martin and Carney townships, bordering Hearst District. Another smaller pocket occurred along the shoreline of Wawa Lake and extended northeast to the southern end of Manitowik Lake in Fiddler Township. Numerous other pockets of damage varying from 40 to 4,730 ha were also mapped outside of these larger areas.

In Blind River District, the most noticeable damage occurred in parts of Gaunt, Lane and Martel townships along Highway 129. Pockets of moderate-to-severe damage covered from 10 to 20 ha, with skeletonizing levels ranging between 50 and 75%.



In Temagami District, 70,475 ha of damage were aerially mapped in the western portion of the district, and moderate-to-severe damage was recorded south and east of the town of Temagami. This infestation encompassed 2,156 ha in Afton and Scholes townships in North Bay District and 125 ha in Seagram Township, Sudbury District. Defoliation in all of the above areas ranged from 80 to 100%. Elsewhere in North Bay District, moderate-to-severe defoliation occurred over 40 ha in Lyman Township and 5 ha in Cameron Township. Light damage was reported at numerous locations in the Espanola, Sudbury and Sault Ste. Marie districts.

In all areas in which moderate-to-severe damage occurred, premature leaf drop resulted. It was not uncommon to find as many as nine larvae feeding on a single leaf, causing browning and leaf loss.

Spruce Budworm,
Choristoneura fumiferana (Clem.)

Population levels of this insect increased across the province. A total of 9,065,781 ha of defoliation was aerially mapped versus 6,783,261 ha in 1990. The bulk of this total occurred throughout the Northwestern and North Central regions (Fig. 2, Table 1).

In Northeastern Region, a total of 41,796 ha of damage was aerially mapped and 41,716 ha of this total occurred in the northwestern corner of Wawa District, particularly in Bomby, Brothers and McCron townships, including White Lake Provincial Park. Most of the defoliation in these

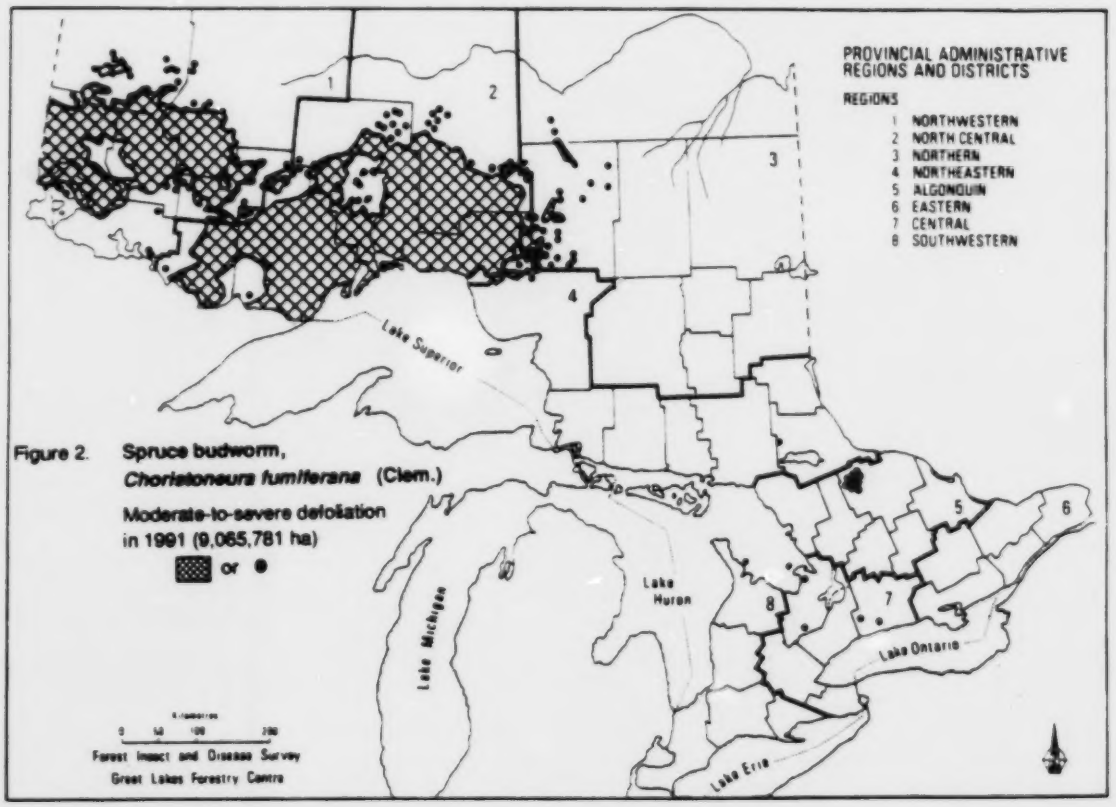


Figure 2. **Spruce budworm, *Choristoneura fumiferana* (Clem.)**

areas occurred on white spruce (*Picea glauca* [Moench] Voss) rather than balsam fir (*Abies balsamea* [L.] Mill.). Light and moderate defoliation also occurred on balsam fir and white spruce along the Dubreuilville road and north to Franz. The townships in which damage was most commonly observed were Dambrossio, Dumas, Pearkes, Tilston and Atkinson, all in Wawa District.

Table 1. Gross area of moderate-to-severe defoliation by the spruce budworm in the Northeastern Region of Ontario in 1990 and 1991.

	Area of moderate-to-severe defoliation (ha)	
District	1990	1991
Sudbury	0	70
North Bay	0	10
Wawa	0	41,716
Total	0	41,796

In Sudbury District, 70 ha of moderate-to-severe defoliation occurred in parts of Ratter and Dunnet townships and 10 ha of similar damage occurred in Hugel Township of North Bay District. In both of the above districts, defoliation ranged from 40 to 75%.

Although no moderate-to-severe infestations of forested land occurred in Sault Ste. Marie District, large populations were observed within the city. Many ornamental spruce and balsam fir as well as small clumps of trees sustained defoliation of up to 80%.

Egg-mass sampling conducted at 44 sample points across the region indicates that various degrees of damage will occur across six districts of the region (Table 2). Pheromone trapping was again conducted in five districts in the region. In all areas, significant increases occurred in the number of males captured, indicating a population increase (Table 3).

Jack Pine Budworm,
Choristoneura p. pinus Free.

Moderate-to-severe defoliation occurred over 9,808 ha in Northeastern Region. The majority of the infestation was located in the Sudbury and Espanola districts (Table 4). In other parts of the province, the infestations that defoliated 665 ha of jack pine (*Pinus banksiana* Lamb.) in Northwestern Region in 1990 increased to cover 71,644 ha in 1991; similarly, the infestation in Algonquin Region increased from 29,660 ha to 57,294 ha. A new infestation totaling 870 ha occurred in Thunder Bay District (Fig. 3).

In Espanola District, 40 to 90% defoliation was observed in Merritt Township and on Great La Cloche Island. Low population levels (averaging less than one larva per branch) were recorded from Manitoulin Island to Durban Township in the northern part of Espanola District.

Along the southern border of Sudbury District, moderate-to-severe defoliation occurred in Allen, Bigwood, Scollard and Martland townships and near the mouth of the French River. Low population levels (averaging less than one larva per branch) were again recorded over a wide area in the western portion of the district from the French River to Moncrieff Township.

In North Bay District, severe defoliation was observed along the southwestern edge of East Mills Township. This infestation extended into Algonquin Region.

Throughout the rest of Northeastern Region, trace population levels were recorded in Sagard Township of Blind River District and in Coleman, Firstbrook and South Lorrain townships of Temagami District. No defoliation was observed in these areas.

Egg-mass sampling in the region (Table 5) was increased this year because of the high population levels observed in the Sudbury and Espanola Districts. The results of this survey indicate that the infestation will continue in 1992 and population levels are expected to remain high in the Espanola area and in the southern part of Sudbury District.

Table 2. Northeastern Region – spruce budworm: Summary of defoliation estimates and egg-mass counts in 1991, and infestation forecasts for 1992.

Location	Host	Estimated defoliation in 1991 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1992[a]	Accumulated damage[b]
Blind River District					
Kirkwood Township	wS	3	103	M–S	0
Nicholas Township	bF	1	12	L	0
Villeneuve Township	bF	0	0	N	0
Espanola District					
Boon Township	bF	0	0	N	0
Robinson Township	wS	2	50	L–M	0
North Bay District					
Crerar Township	bF	12	52	L–M	0
Hugel Township	bF	21	402	S	1
Jocko Township	bF	0	0	N	0
Kirkpatrick Township	bF	0	14	L–M	0
MacBeth Township	bF	0	0	N	0
McWilliams Township	bF	0	0	N	0
Sisk Township	bF	0	6	L	0
Sault Ste. Marie District					
Aweres Township	bF	0	0	N	0
Hodgins Township	bF	0	0	N	0
Jollineau Township	bF	0	0	N	0
Kincaid Township	bF	0	0	N	0
Sault Ste. Marie – 3rd Line	bF	78	438	S	1
Tarbutt Additional Township	bF	3	15	L	0
Sudbury District					
Antrim Township – Halfway Lake Prov. Park	wS	2	0	N	0
Cascaden Township	bF	0	0	N	0
Dunnet Township	bF	2	44	L–M	0
Ratter Township	wS	54	1,022	S	1
Venturi Township	bF	0	7	L	0
Temagami District					
Bar Township	bF	0	0	N	0
Gillies Limit Township	wS	0	0	N	0
Olive Township	bF	0	0	N	0
Strathcona Township	bF	0	0	N	0
Wawa District					
Asselin Township	bF	0	0	N	0
Dahl Township – Obatanga Prov. Park	bF	5	0	N	0
Dambrossio Township – Impact Plot	bF	15	128	M–S	0
Dumas Township	bF	9	275	S	0
Dunphy Township	bF	2	50	M	0
Esquega Township	bF	0	0	N	0
Huotari Township	bF	8	22	L–M	0
Lalibert Township – Impact Plot	bF	5	0	N	0
LaRonde Township	bF	0	0	N	0

(cont'd)

Table 2. Northeastern Region – spruce budworm: Summary of defoliation estimates and egg-mass counts in 1991, and infestation forecasts for 1992 (concl.).

Location	Host	Estimated defoliation in 1991 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1992[a]	Accumulated damage[b]
Wawa District (concl.)					
Maness Township	bF	0	0	N	0
McCron Township	bF	12	92	M–S	1
Mikano Township	wS	73	824	S	1
Pearkes Township	bF	12	360	S	0
Peever Township	bF	0	0	N	0
Recollet Township	bF	0	13	L	0
Tedder Township	bF	14	162	M–S	1
White Lake Prov. Park	bF	74	236	S	1

[a] S = severe, M = moderate, L = light, N = nil

[b] accumulated damage codes: 0 = undamaged; 1 = light damage, <25% total defoliation, usually one season of severe defoliation; 2 = moderate damage, 25 to 60% total defoliation, two or three seasons of severe defoliation; 3 = severe damage, 60 to 80% total defoliation, three to five seasons of severe defoliation, will recover; 4 = moribund or dying, 80 to 100% total defoliation, crowns gray in appearance, top 50–150 cm dead or bare; 5 = <25% of stand dead; 6 = 25–50% of stand dead; 7 = 50–70% of stand dead; 8 = >70% of stand dead; 9 = <25% of stand dead, no significant (0–25%) defoliation for several years; + = 25–50% of stand dead, no significant defoliation for several years; – = 51–70% of stand dead, no significant defoliation for several years.

Table 3. Spruce budworm pheromone trapping in five districts of the Norteastern Region of Ontario in 1991.

Location (Township)	Total number of males captured 1990	1991
Blind River District		
Kirkwood	43	915
North Bay District		
Sisk	0	96
Sault Ste. Marie District		
Jollineau	15	204
Sudbury District		
Dowling	23	450
Wawa District		
Dambrossio Impact Plot	171	2,414
Lalibert Impact Plot	205	781

Table 4. Gross area of moderate-to-severe defoliation by the jack pine budworm in the Northeastern Region of Ontario in 1990 and 1991.

District	Area of moderate-to-severe defoliation (ha) 1990	1991
Espanola	0	810
Sudbury	0	8,708
North Bay	0	290
Total	0	9,808

Larch Casebearer,
Coleophora laricella (Hbn.)

Although population levels decreased in 1991, this insect was still commonly observed on tamarack (*Larix laricina* [Du Roi] K. Koch) in the Wawa, Sault Ste. Marie, Blind River, Espanola, Sudbury and Wawa districts.

The heaviest damage occurred along Highway 11 in Widdifield Township, North Bay District, where a 6-ha stand of 20-m trees sustained 50% defoliation. Moderate (20 to 40%) defoliation was recorded at three locations in Espanola District, a 1.5-ha stand in Baldwin Township and two 3-ha stands in Tehkummah Township. Although heavy damage occurred in Gladstone and Haughton townships of Blind River District in 1990, only trace populations were observed this year. Trace levels of defoliation were also recorded at scattered locations in the Sault Ste. Marie and Wawa districts.

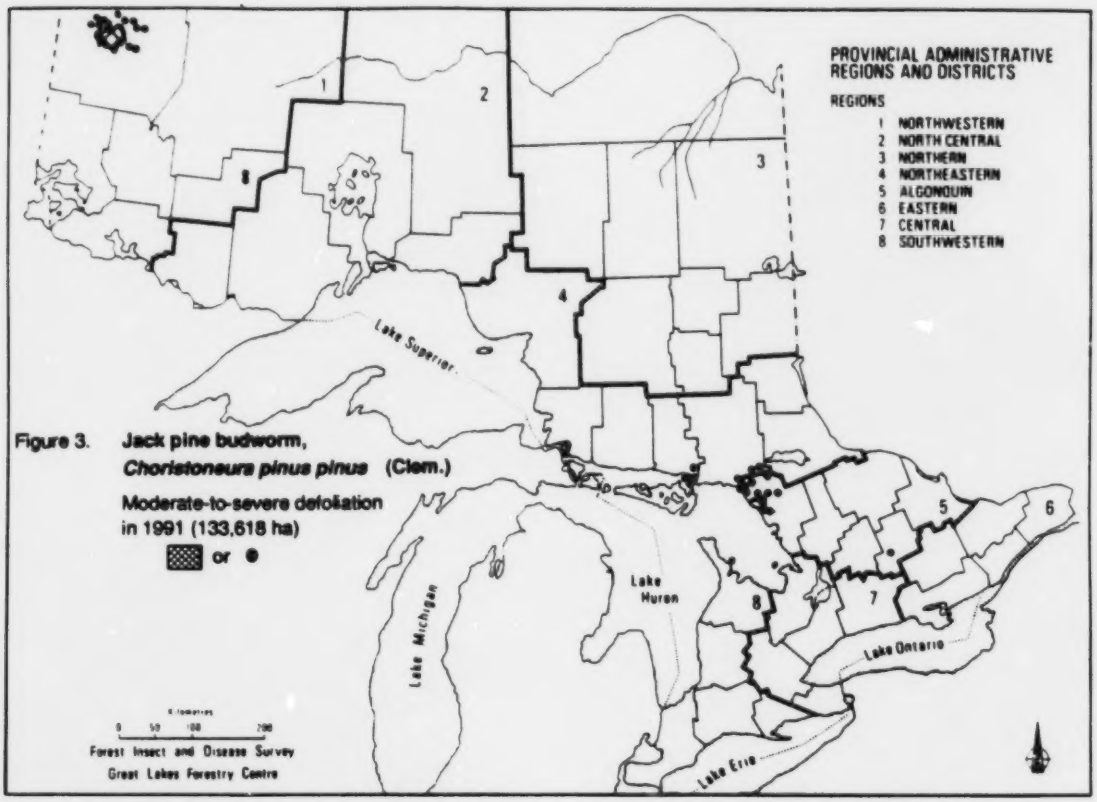


Figure 3. Jack pine budworm, *Choristoneura pinus pinus* (Clem.)

Table 5. Jack pine budworm defoliation estimates and egg-mass counts in 1991 and infestation forecasts for 1992 on jack pine in the Northeastern Region of Ontario.

Location	Estimated % defoliation (1991)	Total number egg masses on six 61-cm branch tips	Infestation forecast for 1992[a]
Blind River District			
Bouck Township	0	2	L
Gaunt Township	0	0	N
Kirkwood Township	0	0	N
Martel Township	0	1	L
Nicholas Township	0	0	N
Sagard Township	0	1	L
Wardle Township	0	0	N
Wells Township	0	3	M
Yaremko Township	0	0	N

(cont'd)

Table 5. Jack pine budworm defoliation estimates and egg-mass counts in 1991 and infestation forecasts for 1992 on jack pine in the Northeastern Region of Ontario (concl.).

Location	Estimated % defoliation (1991)	Total number egg masses on six 61-cm branch tips	Infestation forecast for 1992[a]
Espanola District			
Birch Island	28	7	H
Dunlop Township	2	2	L
Gerow Township	1	0	N
Great La Cloche Island	28	2	L
Hallam Township	4	0	N
Lefebvre Township	1	3	M
Mandamin Township	3	2	L
Monestime Township	1	0	N
Merritt Township – Queensway Road east	41	9	H
– Queensway Road west	58	15	H
Nairn Township	13	5	M
Robinson Township	1	1	L
Teasdale Township	2	1	L
Weeks Township	2	1	L
North Bay District			
McNish Township	0	0	N
Merrick Township	0	1	L
Sault Ste. Marie District			
Parke Township	0	1	L
Sudbury District			
Antrim Township	3	0	N
Bigwood Township – Ham Lake	9	0	N
– Murdock River	8	12	H
Cartier Township	2	0	N
Cox Township	4	2	L
Loudon Township	1	0	N
Lumsden Township	2	1	L
Martland Township	1	0	N
Scollard Township	11	11	H
Ulster Township	5	0	N
Temagami District			
Coleman Township – Family Test east	0	1	L
– Family Test west	0	0	N
– Seed Orchard	2	0	N
Firstbrook Township – Stand Test	0	0	N
– Seed Orchard	0	0	N
– Family Test	0	0	N
Gillies Limit Township	0	1	L
Wawa District			
Maness Township	0	0	N
Recollet Township	0	1	L
Vasiloff Township	2	0	N

[a] N = nil, L = light, M = moderate, H = heavy

Oak Leaf Shredder,
Croesia semipurpurana (Kft.)

No areas of moderate-to-severe defoliation by this pest were observed from ground or aerial surveys within the region. Light feeding in the 10–20% range occurred at sample points in Long and Thessalon townships, Blind River District, on red oak (*Quercus rubra* L.). In Sault Ste. Marie District, light feeding on red oak in Tarentorus Township averaged approximately 10%, whereas defoliation was present at a sample plot in Hilton Township but mainly as a result of feeding by the forest tent caterpillar.

In 1990, 279 male moths were captured in pheromone traps deployed at the four sample plots; however, a significant increase occurred at all trapping sites in 1991, with a total of 1,581 males captured (Table 6). Egg-mass sampling at the four sample points indicates only light damage will occur in 1992.

Eastern Pine Shoot Borer,
Eucosma gloriola Heinr.

Population levels of this shoot borer varied widely across the region. Damage was most prevalent on jack pine, but was also observed on eastern white pine (*Pinus strobus* L.) and on red pine (*Pinus resinosa* Ait.). The incidence of trees with leaders killed ranged from 0.0 to 16.0% (Table 7).

Two jack pine plantations sustained damage to 16% of the leaders. One was a 6-ha, 3.2-m plantation in Coleman Township, Temagami District, and the other was the Finan Township family test site in Wawa District. The Firstbrook Township jack pine family test area in Temagami District was also heavily damaged, with 14.7% of the leaders affected.

Birch Leafminer,
Fenusa pusilla (Lep.)

Moderate-to-severe damage was observed at numerous points in the Blind River, Sault Ste. Marie, Temagami and Wawa districts.

In Sault Ste. Marie District approximately 2-ha of semimature white birch had 80 to 100% of their foliage mined through parts of Curtis and Hughes townships. In Hodgins Township, 1 ha of birch sustained moderate-to-severe leaf mining. Numerous scattered clumps of trees and individual trees along the Ranger Lake Road in Whitman Township averaged 80% of their leaf surface destroyed. Similar damage occurred in the Goulais Bay and Goulais River area in Fenwick Township.

Table 6. Oak leaf shredder pheromone trapping, defoliation estimates, and egg counts in 1991 and defoliation forecasts for 1992 in the Northeastern Region of Ontario.

	Total number of adults captured		Average number per trap		Pheromone concentration (%)	Leaves attacked (%)	Foliar damage (%)	Total number of eggs		Defoliation forecast for
	1990	1991	1990	1991	1991	1991	1991	1990	1991	1992
Blind River District										
Long Township	164	562	27.3	80.2	0.03	10	10	0	2	Light
Thessalon Township	11	108	2.8	21.6	0.003	100	20	2	6	Light
Sault Ste. Marie District										
Hilton Township	96	619	1.6	88.4	0.03	–[a]	–[a]	1	2	Light
Tarentorus Township	8	292	13.7	58.4	0.003	20	10	5	16	Light

[a] defoliation by the forest tent caterpillar

Table 7. Damage by the eastern pine shoot borer in the Northeastern Region of Ontario in 1991 (counts based on an examination of 150 randomly selected trees at each location).

Location (Township)	Host	Estimated area of stand (ha)	Estimated density (trees/ ha)	Average height of trees (m)	Leaders attacked (%)
Blind River District					
Kirkwood Family Test	jP	4	2,500	3.9	4.6
Lane Family Test	jP	20	2,500	2.7	4.6
Sturgeon	jP	16	2,500	2.6	2.0
Villeneuve	jP	10	2,500	1.6	2.6
Espanola District					
Boon	jP	20	2,400	1.9	8.7
Durban Seed Orchard	jP	20	2,100	3.1	10.7
Hallam Seed Orchard	jP	25	2,400	2.9	4.7
Mandamin Family Test	jP	15	1,700	2.2	10.7
Merritt	jP	10	2,300	4.0	2.0
Nairn	jP	5	2,100	1.8	6.0
Robinson	jP	6	1,900	2.0	7.3
Salter	jP	60	2,500	1.9	6.6
North Bay District					
Gurd Seed Orchard	ewP	2	1,900	7.7	1.3
Merrick	jP	15	2,500	3.3	11.3
Sault Ste. Marie District					
Curtis	jP	50	2,500	2.7	4.0
Curtis Seed Orchard	bS	17	2,500	0.4	0.0
Hughes	jP	50	2,500	2.1	0.7
Hurlburt	jP	96	2,500	2.6	11.0
Hynes	jP	50	2,500	1.6	7.3
Hynes	jP	100	2,500	1.3	1.3
Smilsky Family Test	jP	4	2,500	2.9	8.6
Sudbury District					
Lumsden Family Test	jP	5	2,500	2.3	10.0
Lumsden Seed Orchard	jP	10	2,500	2.2	7.3
Moncrieff	jP	6	2,600	1.8	4.7
Munster Family Test	jP	8	2,000	0.4	0.0
Street Family Test	jP	8	2,500	2.2	10.7
Venturi	jP	45	2,400	1.5	2.0
Temagami District					
Coleman	jP	5	2,500	3.2	12.0
Coleman	jP	6	2,500	3.2	16.0
Brewster	jP	10	4,444	2.2	4.0
Firstbrook	jP	18	2,500	1.0	1.3
Firstbrook Family Test	jP	2	2,500	1.3	14.7
Firstbrook	jP	7	2,500	0.9	3.3
Wawa District					
Bailloquet	jP	20	2,500	1.5	2.0
Chenard	jP	25	2,500	2.1	4.0
Finan Family Test	jP	8	2,500	1.9	16.0
Lastheels	jP	4	2,500	1.3	0.0
Nadjiwon	jP	5	2,500	1.7	3.3

Noticeable damage also occurred in Pearkes and Huotari townships, Wawa District. Skeletonizing exceeding 50% was noted in these areas. In Temagami District, damage was mainly confined to ornamental plantings in the town of Temagami and at Finlayson Provincial Park. In the towns of Elliot Lake and Blind River, both in Blind River District, many ornamental trees were attacked, prompting numerous inquiries about control measures and the impact this insect could have on trees.

Gypsy Moth,
Lymantria dispar (L.)

Moderate-to-severe defoliation was aerially mapped at several locations in the Sudbury and Espanola districts (Fig. 4) covering areas of 385 and 56 ha, respectively. Larvae and/or egg-mass sightings were also recorded in the Sault Ste. Marie and North Bay districts.

In Espanola District, severe (75 to 90%) defoliation of red oak occurred in several small, isolated pockets across Manitoulin Island and north to Highway 17. These pockets are usually found on rocky ridge tops with poorly growing red oak and pine trees. On Manitoulin Island, large populations of gypsy moth were found in the Wikwemikong Indian Reserve and in Howland Township. North of the island, moderate-to-severe defoliation occurred in McKinnon Township, on Birch Island and in Hallam Township just east of the town of Webwood. Small populations were observed at scattered locations south of Highway 17.

In Sudbury District, severe (80 to 100%) defoliation of red oak and eastern white pine (up to

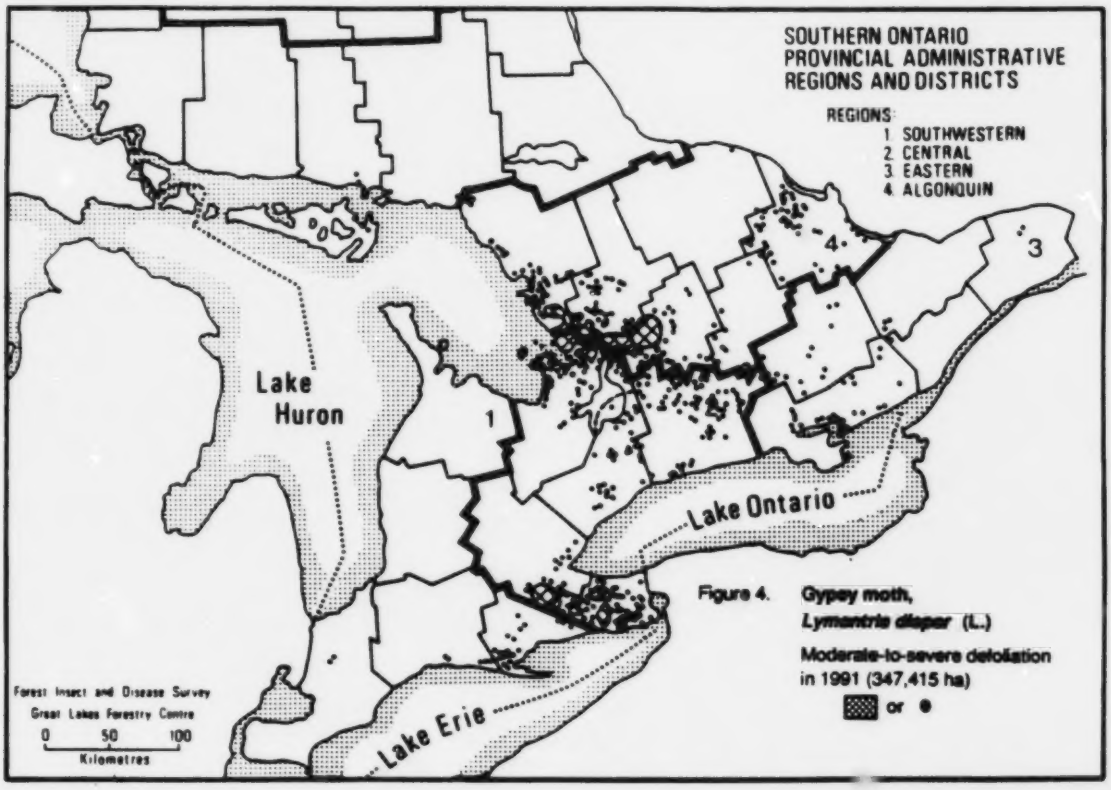


Figure 4. Gypsy moth, *Lymantria dispar* (L.)

90%) occurred on Pine Island in Rutherford Township. A small pocket of oak was also severely defoliated on the northeastern side of the town of Killarney. Low population levels were again observed in Killarney Provincial Park, but only trace levels of defoliation occurred. Trace population levels were also observed at several locations within the Sudbury city limits.

Several egg masses were found in Bellevue Park and near the main post office within the city of Sault Ste. Marie in the spring of 1991. However, no larvae or defoliation were observed.

In Nipissing Township of North Bay District, low levels of both egg masses and larvae were found in a 5-ha area. This infestation is also located along a rocky ridge top hosting a stand of poorly growing red oak.

Gypsy moth pheromone trapping was conducted again in all districts of the region. Positive results were obtained at all locations except the camp grounds in the Wawa and Sault Ste. Marie districts (Table 8).

Table 8. Results of gypsy moth pheromone trapping in the Northeastern Region of Ontario in 1990 and 1991.

Location	Number of traps		Number of male moths captured	
	1990	1991	1990	1991
Blind River District				
Mississagi Prov. Park	10	2	13	11
Espanola District				
Bidwell Township	1	2	26	29
Chutes Prov. Park	2	1	52	36
Gordon Township	2	2	54	54
South Baymouth – ferry dock	1	2	27	44
– trailer park	2	1	58	23
North Bay District				
Antoine Prov. Park	2	2	40	33
Lake Nipissing scenic lookout	1	1	32	25
Marten River Prov. Park	9	2	33	9
Restoule Prov. Park	2	2	41	33
Samuel de Champlain Prov. Park	2	2	19	24
Sault Ste. Marie District				
Pancake Bay Campgrounds	10	2	7	0
Sudbury District				
Fairbanks Prov. Park	10	2	53	26
Halfway Lake Prov. Park	2	2	2	4
Killarney Prov. Park	2	2	43	44
Windy Lake Prov. Park	10	2	27	27
Temagami District				
Finlayson Point Prov. Park	2	2	13	13
Wawa District				
Agawa Bay Campgrounds	10	2	1	2
Crescent Lake Campgrounds	2	2	0	0
Obatanga Prov. Park	2	2	0	0
Rabbit Blanket Campgrounds	10	10	1	0
White Lake Prov. Park	2	2	0	0

Elsewhere in the province, 346,974 ha of moderate-to-severe defoliation were mapped in the Eastern, Algonquin, Central and Southwestern regions (Fig. 4). This is an increase from the 77,648 ha of defoliation in 1990. The bulk of this damage occurred in the Algonquin and Central regions, with 208,483 and 129,453 ha defoliated, respectively.

Forest Tent Caterpillar,
Malacosoma disstria Hbn.

Populations of this insect continued to decline for the second year in a row (Fig. 5). The area of moderate-to-severe defoliation decreased in six districts of the region by a total of 1,142,981 ha; however, an increase of 347,734 ha occurred in Wawa District (Table 9).

The largest pocket (847,431 ha) mapped from the air occurred in Wawa District (Fig. 6). The infestation encompasses an area extending from the town of Dubreuilville, south into Pukaskwa National Park, westwards to the Hemlo area of Terrace Bay District and northwards into Hearst District. Smaller pockets ranging from 90 ha to 3,155 ha also occurred in the Lochalsh and Missanabi areas and further north in parts of Meath, Challener and Acton townships.

The second largest area of moderate-to-severe defoliation (741,494 ha) included parts of the western portion of North Bay District and extended west into Sudbury District, including most of Harty, Hess, Hart, Munster, Ulster, Stralak and Moncrieff townships, and into part of Craig Township in Espanola District. Several smaller pockets also occurred from the town of Massey north to Mandamin Township, Espanola District.

In Blind River District, 68,338 ha of moderate-to-severe defoliation occurred in the central parts of the district and numerous small pockets were mapped in the eastern parts of Sault Ste. Marie District, including St. Joseph Island, with a total of 3,045 ha defoliated. The bulk of the defoliation was on trembling aspen (*Populus tremuloides* Michx.), although oak, sugar maple (*Acer saccharum* Marsh.) and ash (*Fraxinus* spp.) sustained various degrees of defoliation.

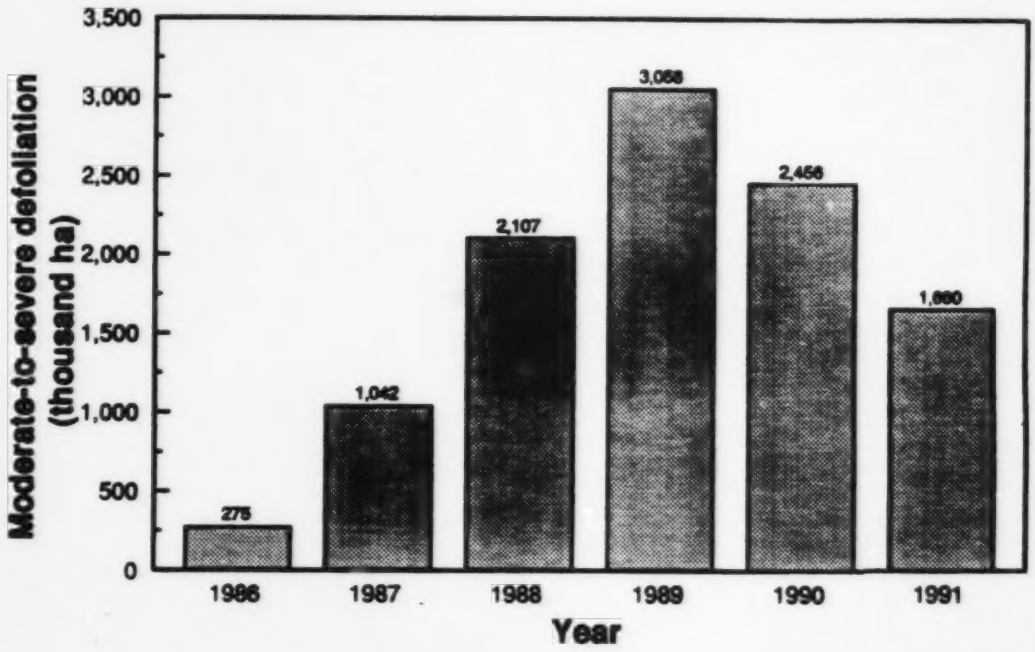


Figure 5. Defoliation by the forest tent caterpillar in the Northeastern Region of Ontario from 1986 to 1991.

Egg-band sampling (Table 10, Fig. 7) conducted at 73 locations across the region indicates that moderate-to-severe defoliation will continue in Wawa District in 1992. In the Sudbury and Espanola districts, the infestation will remain widespread; however, the populations appear to be declining and defoliation will be less intensive and consist of smaller pockets. This will also be the situation for several townships of North Bay District that were defoliated in 1991. In Blind River District, populations are expected to decline, with only light-to-moderate infestations forecast. No infestations are forecast in Sault Ste. Marie District.

Table 9. Gross area of moderate-to-severe defoliation by the forest tent caterpillar from 1989 to 1991 in the Northeastern Region of Ontario.

	Defoliation (ha)			Change (ha)	
District	1989	1990	1991	1990	1991
Blind River	208,878	200,445	68,338	-8,433	-132,107
Espanola	615,345	657,717	140,322	+42,372	-517,395
North Bay	1,031,622	145,570	59,912	-886,052	-85,658
Sault Ste. Marie	116,107	102,669	3,045	-13,438	-99,624
Sudbury	843,409	849,127	541,260	+5,718	-397,867
Temagami	160,770	330	0	-160,440	-330
Wawa	80,143	499,697	847,431	+419,554	+347,743
Total	3,056,274	2,455,555	1,660,308	-600,719	-885,247

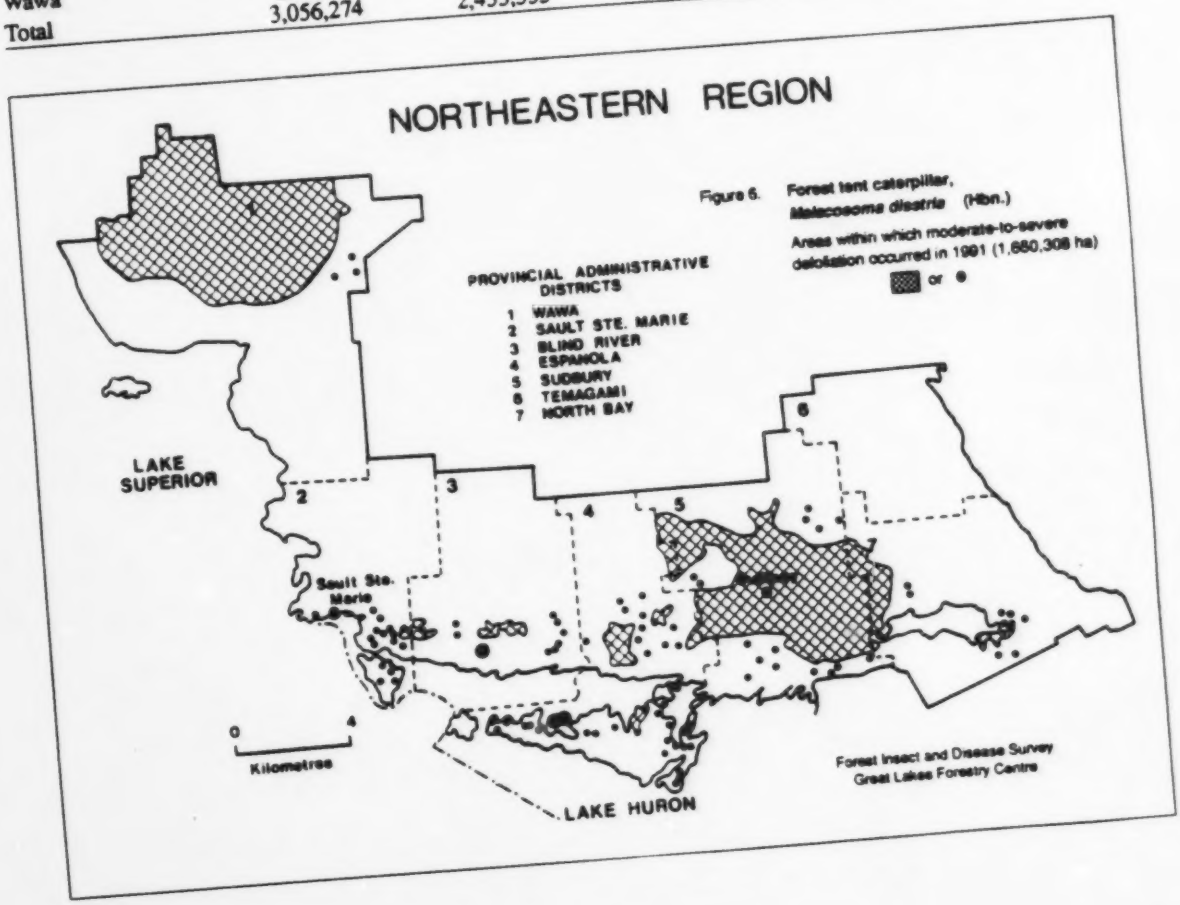


Table 10. Forest tent caterpillar egg-band counts on trembling aspen in the Northeastern Region of Ontario in 1991 and infestation forecasts for 1992.

Location	Mean DBH (cm)	Mean number of egg bands	Infestation forecast for 1991[a]
Blind River District			
Albanel Township	12.0	0.0	N
Bouck Township	10.0	2.3	M
Bouck Township – Dunlop Lake	10.0	3.3	M
Bright Township	11.6	0.7	L
Gladstone Township	9.3	3.0	M
Gould Township	10.0	1.0	L
Grasett Township	12.6	1.6	L
Gunterman Township	11.0	4.0	M
Haughton Township	10.3	0.7	L
Kirkwood Township	10.6	0.7	L
Lefroy Township	11.3	1.7	L
Nouvel Township	11.6	3.0	M
Parkinson Township	12.0	3.7	M
Patton Township	10.0	4.3	M
Poulin Township	12.0	0.0	N
Proctor Township	10.3	1.3	L
Raimbault Township	10.5	3.0	M
Sagard Township – Mount Lake	11.0	0.0	N
Scarfe Township	11.0	2.0	M
Spragge Township	12.6	0.0	N
Striker Township	10.6	2.3	M
Thompson Township	12.0	0.0	N
Thessalon Township	11.6	0.7	L
Wells Township	11.3	2.7	M
Espanola District			
Assiginack Township	13.4	0.7	L
Barrie Island Township	12.2	0.3	L
Bidwell Township	10.4	3.3	M
Dawson Township	13.2	3.0	M
Lockeyer Township	17.3	3.0	L
Nairn Township	13.0	3.3	M
Salter Township	10.2	3.0	M
Shedden Township	11.3	0.7	L
Weeks Township	15.5	0.7	L
North Bay District			
Crerar Township	14.8	9.3	S
East Ferris Township	13.8	5.0	M
North Himsworth Township	12.5	2.7	M
Sault Ste. Marie District			
Highway 17B – Finn Hill	11.0	0.0	N
Johnson Township	10.6	0.0	N

(cont'd)

Table 10. Forest tent caterpillar egg-band counts on trembling aspen in the Northeastern Region of Ontario in 1991 and infestation forecasts for 1992 (concl.).

Location	Mean DBH (cm)	Mean number of egg bands	Infestation forecast for 1991[a]
Sault Ste. Marie District (concl.)			
Macdonald Township	11.3	0.0	N
Park Township	12.3	1.0	L
Plummer Township	12.7	1.3	L
Prince Township	11.0	1.0	L
VanKoughnet Township	11.0	0.0	N
St. Joseph Island – Hamilton Bay	10.0	1.6	L
– Mosquito Bay	9.0	2.3	M
– Whiskey Bay	9.0	1.0	L
Sudbury District			
Antrim Township	13.1	0.7	L
Appleby Township	13.1	19.0	S
Cosby Township	11.9	5.7	S
Denison Township	11.2	2.7	L
Dill Township	12.2	41.0	S
Dowling Township	11.5	17.0	S
Lumsden Township	14.8	15.7	S
Moncrieff Township	15.7	12.0	S
Norman Township	13.5	18.0	S
Servos Township	14.2	17.3	S
Street Township	15.4	32.0	S
Wawa District			
Abraham Township	13.0	26.0	S
Dahl Township – Obatanga Prov. Park	10.0	31.0	S
Dahl Township – Kabenung Lake	9.0	29.0	S
Dambrossio Township – Dubreuilville Road	16.0	36.0	S
– Desolation Lake	11.0	29.0	S
Dumas Township	14.5	37.0	S
Esquega Township	12.6	0.0	N
Lalibert Township	11.0	10.0	S
Lendrum Township	11.0	0.0	N
McDowell Township	11.0	56.0	S
Mikano Township	10.0	19.0	S
Pearkes Township	13.5	78.0	S
Rennie Township	12.0	0.0	N
Simpson Township	10.0	33.0	S
Strickland Township	9.0	36.0	S
West Township	12.3	2.3	M

[a] N = Nil, L = Low, M = Moderate, S = Severe

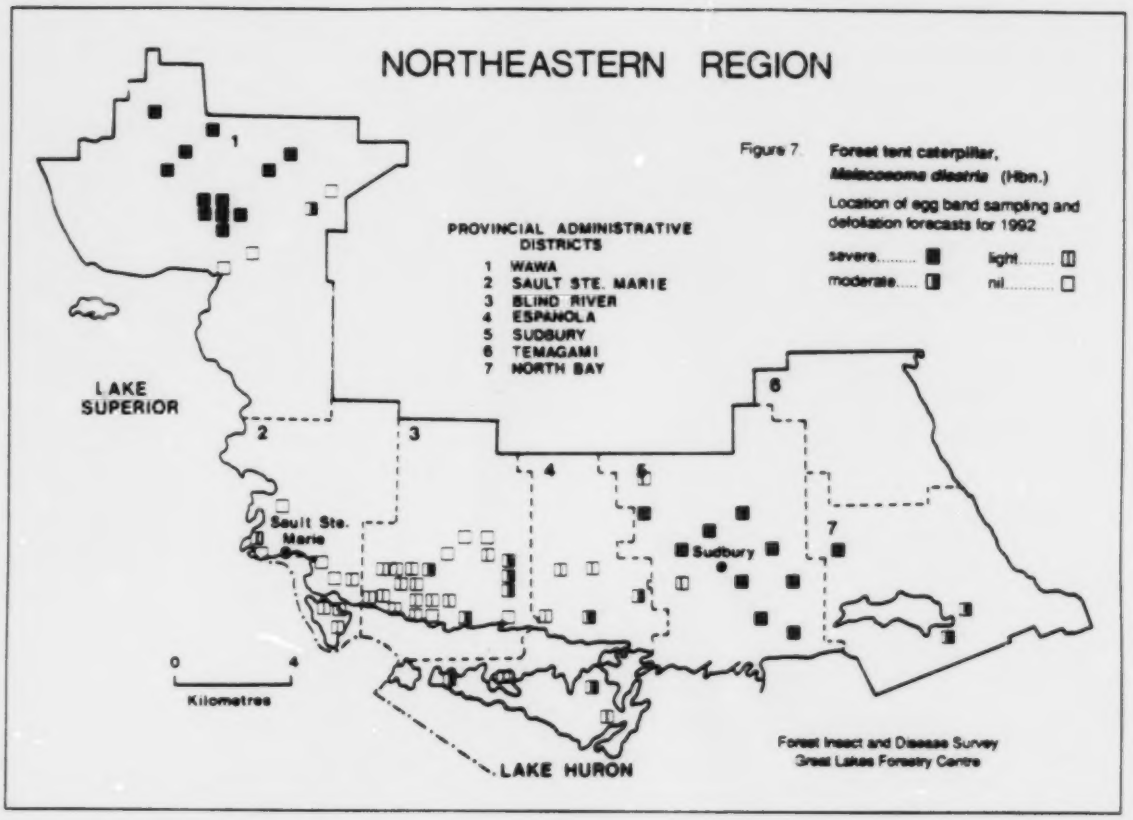


Figure 7. Forest tent caterpillar, *Malacosoma disstria* (Hbn.)
Location of egg band sampling and defoliation forecasts for 1992

Redheaded Pine Sawfly,
Neodiprion lecontei (Fitch)

Populations of this defoliator were commonly observed in the southern portions of the Blind River, Espanola, Sudbury and North Bay districts. A wide range of defoliation was observed in Espanola District and it was not unusual to observe single trees or plantations of red pine totally stripped of foliage.

This insect was most abundant in several areas of Espanola District. The heaviest damage occurred in an 85-ha plantation in Tennyson Township. Most (79%) of the 1.8-m red pine sustained 71% defoliation and considerable mortality is expected at this location in 1992. Numerous smaller plantations sustained heavy damage on from 5 to 33% of the trees, with 10 to 54% defoliation in Tennyson and Salter townships (Table 11). The infestation has, however, collapsed in other areas of Espanola District. Although larval population levels were low in 1991, defoliation in previous years has resulted in 40% mortality in a 20-ha plantation in Gough Township and 35% mortality in a 10-ha plantation in Shakespeare Township.

The population levels of this insect increased in Sudbury District in 1991, particularly in the Chelmsford area. The heaviest damage was observed in Balfour Township, where 20% defoliation occurred on 20% of the trees in a 1-ha plantation of 0.9-m red pine.

In the Blind River and North Bay districts, population levels have decreased substantially. In Blind River District, the heaviest damage occurred in Lewis Township, where 9% of the 0.8-m red pine sustained an average of 11% defoliation. In North Bay District, the highest population levels occurred in Mattawan Township, where 27% of the 5-m red pine were affected, with 5% defoliation over a 10-ha area. Light (15%) feeding was also recorded in Curtis Township, Sault Ste. Marie District.

Several spray operations were carried out by OMNR staff in the Espanola and North Bay Districts. In Espanola District, the nuclear polyhedrosis virus and the chemical Malathion were applied to red pine and jack pine; in North Bay District, only Malathion was used. Spray operations are expected to be carried out in 1992 in Espanola District.

White Pine Weevil,
Pissodes strobi (Peck)

Population levels of this insect remained much the same as in 1990; however, a few areas showed large increases in 1991. In the areas evaluated, the number of leaders attacked ranged from 0 to 28% (Table 12). The highest percentage of damaged leaders occurred in Hurlburt Township, Sault Ste. Marie District, where 28% of the leaders were destroyed on 2.4-m jack pine over 110 ha. Heavy damage also occurred in Salter Township of Espanola District, where a 60-ha jack pine plantation sustained leader damage on 26% of the trees.

Table 11. Defoliation caused by the redheaded pine sawfly in the Northeastern Region of Ontario in 1991 (counts based on an examination of 150 randomly selected trees at each site).

Location (Township)	Host	Estimated stand area (ha)	Average height of trees (m)	Trees affected (%)	Average defoliation (%)	Mortality (%)
Blind River District						
Lewis	rP	2	0.9	9.3	11.0	–
Espanola District						
Carnarvon	rP	2	1.9	5.0	10.0	–
Gough	rP	5	2.2	8.0	20.0	0.7
Gough	rP	20	2.3	2.8	5.0	40.0
Salter	rP	20	0.9	27.3	54.0	4.0
Salter	rP	20	1.8	33.3	35.0	0.7
Shakespeare	rP	10	2.2	0.0	0.0	35.0
Shakespeare	rP	3	0.4	9.0	75.0	0.7
Tennyson	rP	85	1.8	79.0	71.0	–
Tennyson	rP	5	2.9	18.0	10.0	–
Tennyson	rP	15	2.2	5.0	10.0	–
Tennyson	rP	5	1.8	22.0	20.0	0.7
North Bay District						
Bonfield	rP	2	2.5	5.0	5.0	–
Cameron	rP	10	1.7	0.7	10.0	–
Cameron	rP	8	0.9	0.0	0.0	–
Mattawan	rP	60	4.5	0.0	0.0	–
Mattawan	rP	10	5.0	27.0	5.0	–
Sault Ste. Marie District						
Curtis	rP	4	0.6	2.0	15.0	–
Sudbury District						
Balfour	rP	1	0.9	20.0	20.0	4.0
Lumsden – Seed Orchard	jP	11	2.2	0.7	5.0	–
Venturi	rP	20	1.1	8.0	50.0	1.3
Venturi	jP	60	1.6	4.0	20.0	0.7

Table 12. Damage by the white pine weevil in pine plantations in the Northeastern Region of Ontario in 1991 (counts based on an examination of 150 randomly selected trees at each site).

Location (Township)	Host	Estimated stand area (ha)	Estimated number of trees per ha	Average height of trees (m)	Leaders attacked (%)
Blind River District					
Kirkwood Family Test	jP	4	2,500	3.9	3.0
Lane	jP	20	2,500	2.7	9.0
Lane Family Test	jP	4	2,500	2.9	2.6
Sturgeon	rP	10	2,500	1.6	3.3
Villeneuve	jP	3	2,500	2.6	6.0
Espanola District					
Boon	jP	20	2,400	1.9	2.0
Durban Seed Orchard	jP	20	2,100	3.1	4.0
Hallam Seed Orchard	jP	25	2,400	2.9	2.7
Hallam Seed Orchard	ewP	3	1,200	0.8	1.3
Mandamin Family Test	jP	15	1,700	2.2	6.0
Merritt	jP	10	2,300	4.0	1.3
Nairn	jP	5	2,100	1.8	2.0
Robinson	jP	6	1,900	2.0	1.3
Rowat	jP	40	1,700	3.7	3.3
Salter	jP	60	2,500	1.9	26.0
Tennyson	ewP	7	2,400	1.7	15.3
North Bay District					
Gurd Seed Orchard	ewP	2	1,900	7.7	4.7
Mattawan Seed Orchard	ewP	4	800	1.0	0.0
Mattawan	ewP	2	2,100	1.7	4.0
Merrick	jP	15	2,500	3.3	2.7
Pardo	ewP	10	2,400	2.2	21.3
Phelps	ewP	6	2,300	1.1	3.3
Sisk	ewP	3	2,500	2.3	17.3
Sault Ste. Marie District					
Curtis	jP	50	2,500	2.7	10.6
Curtis Seed Orchard	jP	11	2,500	0.4	0.0
Hughes	jP	50	2,500	2.1	20.0
Hurlburt	jP	110	2,500	2.4	28.0
Hynes	jP	50	2,500	1.6	21.0
Hynes	jP	110	2,500	1.3	2.0
Smilsky Family Test	jP	4	2,500	2.9	6.0
Sudbury District					
Lumsden Family Test	jP	5	2,500	2.3	11.3
Lumsden Seed Orchard	jP	10	2,500	2.2	7.3
Moncrieff	jP	6	2,600	1.8	4.7
Munster Family Test	jP	8	2,000	0.4	0.0
Street Family Test	jP	8	2,500	2.2	4.7
Venturi	jP	45	2,400	1.5	2.0

(cont'd)

Table 12. Damage by the white pine weevil in pine plantations in the Northeastern Region of Ontario in 1991 (counts based on an examination of 150 randomly selected trees at each site) (concl.).

Location (Township)	Host	Estimated stand area (ha)	Estimated number of trees per ha	Average height of trees (m)	Leaders attacked (%)
Temagami District					
Coleman	jP	20	2,500	3.0	0.0
Coleman	jP	5	2,500	3.2	2.0
Coleman	jP	6	2,500	3.1	0.7
Brewster	jP	10	4,444	2.2	7.3
Firstbrook	jP	18	2,500	1.0	0.7
Firstbrook Stand Test	jP	2	2,500	1.3	1.3
Firstbrook	jP	6	2,500	0.9	1.3
Wawa District					
Bailloquet	jP	20	2,500	1.5	3.3
Cecile	jP	8	2,500	3.0	1.3
Chenard	jP	25	2,500	2.1	3.3
Finan	jP	8	2,500	1.9	2.0
Lastheels	jP	4	2,500	1.3	2.6
Nadjiwon	jP	5	2,500	1.7	2.6
Odlum	jP	15	2,500	3.0	1.4
Vasiloff	jP	50	3,000	2.3	2.6

Minor Insects

Pine Spittlebug,
Aphrophora cribrata (Wlk.)

Low population levels of this insect were commonly observed in the Blind River, Espanola, Sudbury, North Bay and Temagami districts. Large numbers occurred in a 2-ha area in Dawson Township of Espanola District. At this location, 90% of the 1.8-m Scots pine (*Pinus sylvestris* L.) were affected, with an average of 10 spittlebugs per tree. In Wells and Lane townships of Blind River District, 20% of the 1- to 3.5-m jack pine were affected. In Temagami District the largest population occurred in Firstbrook Township, where 4% of the 1.3-m jack pine were attacked over an area of 2 ha.

Jack Pine Tip Beetle,
Conophthorus resinosae Hopk.

Low populations levels of this beetle occurred at several jack pine plantations in the Espanola, Sudbury, Temagami and Wawa districts. The heaviest damage occurred in Coleman Township of Temagami District, where 16% of the trees were affected, 0.7% severely, over an area of 10 ha. In the Hallam Township seed orchard in Espanola District, 12% of the trees were affected. The 50-ha Knowles Township family test area in Wawa District sustained damage to 2.6% of the trees.

Pitted Ambrosia Beetle,
Corthylus punctatissimus (Zimm.)

For the second year in a row, 0.5-m sugar maple regeneration was killed in Thessalon Township, Blind River District. Heavy mortality (50%) occurred over an area of 2 ha at this site. In Allan Township of Espanola District and Pringle Township of North Bay District, 10% mortality of understory maple occurred over areas of 1.5 and 1 ha, respectively.

Table 13. Other forest insects.

Insect	Host(s)	Remarks
Acantholyda erythrocephala (L.) Pine false webworm	jP, rP	Light (1 to 5%) defoliation was reported at various locations across the Espanola and North Bay districts. Heavy damage occurred within the Sudbury city limits, where several 1.5- to 4-m red pine sustained 80% defoliation.
Archips cerasivorana (Fitch) Uglynest caterpillar	cherry	The largest population occurred in Campbell Township, Espanola District, where 20% of the trees were affected, with 50% defoliation, in a 0.5-ha area. Small populations were also observed in the Temagami and North Bay districts.
Archips negundana (Dyar) Larger boxelder leafroller	mM	The population level of this insect has decreased since 1990 in the city of Sudbury. However, 75% of the 9-m trees in the western section of Sudbury sustained 25% defoliation in 1991.
Argyresthia aureoargentella Brower Cedar leafminer	ewC	Low population levels occurred along the southern coast of Manitoulin Island. The largest population occurred over a 1-ha area in Dawson Township, Espanola District, where 80% of the trees were affected, with 5% defoliation.
Choreutis pariana (Cl.) Apple-and-thorn skeletonizer	Apple	Moderate-to-severe skeletonizing of foliage occurred throughout the city of Sault Ste. Marie. Defoliation ranged from 75 to 100%.
Coleotechnites piceaella (Kft.) Orange spruce needleminer	wS	75% of the needles were mined at a picnic area in Plummer Additional Township on 15-m trees.
Dasineura balsamicola (Lint.) Introduced false balsam gall midge	bF	Foliar damage of from 5 to 30% occurred in a 0.5-ha area of 4-m trees in South Lorrain Township, Temagami District.
Diprion similis (Htg.) Introduced pine sawfly	ewP	5% defoliation occurred on all classes of trees in the Basswood Lake area, Kirkwood Township, Blind River District, and along Highway 17 at the Garden River Indian Reserve, Sault Ste. Marie District.
Dryocampa rubicunda (F.) Greenstriped mapleworm	rM	Small numbers of this insect were observed on understory trees at Flack Lake in Raimbault Township, Blind River District. Foliar damage was less than 10%.
Gilpinia hercyniae (Htg.) European spruce sawfly	wS	Low population levels were recorded on new shoots over a 5-ha area of 10-m trees in South Lorrain Township, Temagami District.
Goniocteno americana (Schaeff.) American aspen beetle	tA	30% defoliation occurred on 80% of the 2-m regeneration in Gurd Township, North Bay District. Low levels of damage were observed in old cutovers in the Temagami, North Bay and Sudbury Districts.
Hyphantria cunea (Drury) Fall webworm	deciduous	Large numbers of this insect, causing 75% defoliation, were observed along Gordon Lake Road in Johnson Township, Sault Ste. Marie District. In Robinson Township, on Manitoulin Island, 15% of the cherry (*Prunus* spp.) trees were affected, with 10% defoliation in a 1-ha area.
Malacosoma americanum (F.) Eastern tent caterpillar	cCh	Large numbers of tents were observed along the Maple Ridge Road in Thessalon Township, Blind River District, and along Highway 637 west of Highway 69 in Sudbury District.

(cont'd)

Table 13. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Malacosoma californicum pluviale (Dyar) Northern tent caterpillar	deciduous	Trace levels were observed at Desolation Lake in Dambrossio Township, Wawa District.
Neodiprion pratti banksianae Roh. Jack pine sawfly	jP	Light defoliation was recorded over a 0.5-ha area of 4-m trees in Finlayson Provincial Park, Strathcona Township, Temagami District.
Neodiprion n. nanulus Schedl. Red pine sawfly	rP, jP	This sawfly caused 10% defoliation to 80% of the 2.2-m trees in the Ramsey Lake area of the city of Sudbury. Small populations causing trace levels of defoliation were re[illegible]ed in the red pine seed orchard in Gurd Township, North B[illegible]istrict.
Neodiprion sertifer (Geoff.) European pine sawfly	ScP	Low population levels were observed across Manitoulin Island and in Kirkwood Township, Blind River District. The heaviest damage occurred in Dawson Township, Espanola District, where 90% of the 2.0-m trees were affected, with 5% defoliation over a 0.5-ha area. Occasional colonies were also observed within the city of Sault Ste. Marie.
Neodiprion swainei Midd. Swaine jack pine sawfly	jP	40 to 80% defoliation was observed on individual trees over an area of 2 ha on Island 156 in Lake Temagami, Temagami District.
Orgyia leucostigma intermedia Fitch White-marked tussock moth	deciduous	Defoliation ranging from 25 to 75% occurred on ornamental plantings in the city of Sault Ste. Marie.
Petrova albicapitana (Bsk.) Northern pitch twig moth	jP	Low population levels were observed in the northern portions of the Espanola and Sudbury districts. The heaviest damage occurred in Moncrieff Township, Sudbury District, where 3% of the main stems were affected in a 5-ha area.
Phyllonorycter ontario (Free.) Aspen leafblotch miner	tA	Large numbers of miners were observed on 1- to 3-m regeneration, causing 100% foliar damage, in Rose and Bridgland townships, Blind River District.
Pikonema alaskensis (Roh.) Yellowheaded spruce sawfly	wS, bS	Single trees and small clumps of 2-m trees in Bigwood and Cox townships, Sudbury District, sustained 75% defoliation. Severe defoliation was also observed on open-grown ornamental trees within the city of Sudbury.
Pineus strobi (Htg.) Pine bark adelgid	ewP	20% of the 1.9-m trees were affected over a 2-ha area in French Township, North Bay District. Plantations averaging 1.5 m in height sustained damage to 1.3 and 17.3% of their trees, respectively, in Chambers and Milne townships, Temagami District.
Pristiphora geniculata (Htg.) Mountain-ash sawfly	aMo	Large populations were observed in the city of Sault Ste. Marie causing defoliation ranging from 10 to 100%; however, defoliation averaged 45% in most cases. Numerous colonies were also found at several locations in Peever Township, Sault Ste. Marie District, and across Blind River District, causing a wide range of defoliation.

(cont'd)

Table 13. Other forest insects (concl.).

Insect	Host(s)	Remarks
Rhyacionia adana Heinr. Pine tip moth	jP	The 13-ha seed orchard in Hambleton Township, Wawa District, sustained damage to 35% of the 1-year-old seedlings. Two plantations in Firstbrook Township, Temagami District, had 28.7 and 12.7% of the trees affected, with one to five insects on each leader.
Rhynchaenus rufipes (LeC.) Willow flea weevil	willow	Large populations were observed between the towns of Chelmsford and Wahnapitae. Particularly heavy leafmining damage occurred in the town of Hanmer and in the northern section of the city of Sudbury.
Tetralopha aplastella (Hlst.) Aspen webworm	tA	Individual trees sustained 20 to 40% foliar damage on open-grown 3-m regeneration in Cynthia and Strathcona townships, Temagami District.
Toumeyella parvicornis (Ckll.) Pine tortoise scale	jP	Low population levels were observed in the Espanola, Sudbury and Temagami districts. The heaviest damage occurred in Antrim Township, Sudbury District, where 15% of the trees were affected in a 1.5-ha area.

TREE DISEASES

Major Diseases

Armillaria Root Rot

Armillaria ostoyae (Romagn.) Herink

The Armillaria root rot fungus is known to attack and kill all tree species, especially trees that have been weakened by other factors such as drought. Over the past few years, this pathogen has been commonly observed at low levels, usually in the 1–2% range. However, at a progeny test site in Kirkwood Township, Blind River District, 6, 4.6 and 5.3% mortality occurred in 1988, 1990 and 1991, respectively. As a result of this current and past mortality, and since the disease tends to kill trees in small clumps, undesirable gaps in the stand have developed at this site. The areas evaluated are summarized in Table 14.

Extensive mortality of white birch caused by the Armillaria root rot fungus occurred in the Sudbury and Espanola districts and is described in the Drought Damage section of this report.

Table 14. Damage caused by Armillaria root rot in the Northeastern Region of Ontario in 1991 (counts based on an examination of 150 trees at each location).

Location (Township)	Host	Estimated stand area (ha)	Average height of trees (m)	Current mortality (%)
Blind River District				
Kirkwood Progeny Test	jP	4	3.9	5.3
Lane Family Test	jP	4	2.9	0.0
Sturgeon	jP	10	1.6	0.0
Villeneuve	jP	3	2.6	0.7
Espanola District				
Boon	jP	20	1.9	0.7
Boon	jP	2	2.2	2.0
Durban Seed Orchard	jP	20	2.2	0.7
Hallam Seed Orchard	jP	25	2.9	0.7
Mandamin Family Test	jP	15	2.2	0.0
Robinson	jP	6	2.0	0.0
North Bay District				
Gurd Seed Orchard	ewP	2	7.7	0.0
Eddy	rP	10	2.2	0.7
Olrig	rP	5	2.1	0.7
Phelps	rP	1	1.2	0.7
Sault Ste. Marie District				
Curtis	jP	50	2.7	0.0
Curtis Seed Orchard	bS	17	0.5	0.0
Hughes	jP	50	2.1	0.0
Hurlburt	jP	100	2.4	0.0
Hynes	jP	50	1.6	0.0
Sudbury District				
Lumsden Seed Orchard	jP	10	2.2	1.3
Moncrieff	jP	3	1.5	2.0
Venturi	jP	10	1.7	0.7
Temagami District				
Brewster	jP	10	2.2	0.7
Coleman Seed Orchard	jP	20	3.0	0.7
Firstbrook Seed Orchard	jP	18	1.0	0.7
Firstbrook Family Test	jP	7	0.9	1.3

(cont'd)

Table 14. Damage caused by Armillaria root rot in the Northeastern Region of Ontario in 1991 (counts based on an examination of 150 trees at each location) (concl.).

Location (Township)	Host	Estimated stand area (ha)	Average height of trees (m)	Current mortality (%)
Wawa District				
Bailloquet	jP	20	1.5	0.0
Chenard Seed Orchard	jP	25	2.1	0.0
Finan Family Test	jP	8	1.9	0.0
Knowles	jP	70	2.7	0.0
Lastheels	jP	50	1.3	0.0
Nadjiwon	jP	5	1.7	1.3
Vasiloff	jP	50	2.0	0.0

White Pine Blister Rust,
Cronartium ribicola J.C. Fischer

This rust fungus continues to be a problem in young eastern white pine plantations in the Temagami and North Bay districts (Table 15). Low incidence levels commonly occurred across the rest of the region. The most severe damage was recorded in an 8-ha stand in Milne Township, Temagami District. At this location, 34.7% of the 1.2-m eastern white pine were infected, of which 18.7% were main-stem infections. In Olrig Township, North Bay District, 11.3% of the 2.2-m pine were affected, 5.3% severely, over a 1.5-ha area.

Table 15. Damage caused by white pine blister rust in plantations of eastern white pine in the Northeastern Region of Ontario in 1991.

Location (Township)	Estimated stand area (ha)	Average height of trees (m)	Trees affected (%)	Trees affected severely (%)
Espanola District				
Allan	2.0	2.7	2.0	0.7
Burpee	2.5	2.2	1.3	0.7
Hallam Seed Orchard	2.0	0.5	0.0	0.0
Tennyson	1.5	1.6	2.0	0.7
North Bay District				
Antoine	7.0	1.2	8.0	6.0
French	2.5	0.9	0.7	0.0
Gurd Seed Orchard	2.5	8.0	2.7	0.7
Mattawan	4.0	2.3	6.7	2.7
Mattawan Seed Orchard	7.0	0.5	0.0	0.0
Mattawan	1.5	1.5	6.7	4.0
Olrig	1.5	2.2	11.3	5.3
Pardo	5.0	2.2	2.0	0.7
Sisk	1.5	2.0	2.7	0.7
Temagami District				
Chambers	10.0	1.6	14.0	6.7
Chambers	20.0	1.8	15.3	6.7
Milne	10.0	1.2	34.7	18.7

Western Gall Rust,
Endocronartium harknessii (J.P. Moore) Y. Hirats.

This disease, which can kill small trees, was common in several jack pine plantations in the Region. The incidence of infected trees ranged from 0 to 64.6%, with trees ranging from 1.4 to 4.5 m in height (Table 16). In Blind River District, the highest level of affected trees occurred in Lane Township over an area of 16 ha. Here, the incidence of infection was 64.6%, and 36% of the trees had galls on the main stem. In Wells Township, 19% of the 4.5-m trees were affected, 6% severely.

In Mandamin Township, Espanola District, 5% incidence occurred over a 15-ha area, with 0.7% of the trees infected on the main stem. Elsewhere in the region, very little damage was observed.

Scleroderris Canker,
Gremmeniella abietina (Lagerb.) Morelet

Intensive surveys to detect this pathogen continued in 1991, particularly in North Bay District, to determine the extent of infection caused by the North American race and the more virulent European race. The European race has been recorded in Strong Township, Bracebridge District, just south of Trout Creek, North Bay District; however, only the North American race has been collected to date in Northeastern Region.

Damage by the North American race of this fungus was detected in three districts of the region (Table 17). At a jack pine family test site in Smilsky Township, Sault Ste. Marie District, 67% of the 2.4-m trees were affected over a 4-ha area. Of this total, 44.6% of the trees were severely damaged. In Olrig Township, North Bay District, this disease was found in three plantations. The heaviest damage occurred in a 5-ha, 2.5-m red pine plantation, which sustained infections on 35.3% of its trees. No new mortality was observed in this stand. An incidence level of 14.6% was observed in a 5-ha area of jack pine averaging 1.3 m tall at a location in Recollet Township, Wawa District, where mortality was 14%.

Table 16. Damage caused by western gall rust in jack pine plantations in the Northeastern Region of Ontario in 1991.

Location (Township)	Estimated stand area (ha)	Average height of trees (m)	Trees affected (%)	Trees affected severely (%)
Espanola District				
Durban Seed Orchard	20	2.2	2.0	0.0
Mandamin	15	2.0	5.0	0.7
Blind River District				
Lane	16	2.9	64.6	36.0
Lane Progeny Test	4	2.7	6.6	0.0
Kirkwood Progeny Test	4	2.9	5.3	0.0
Sturgeon	4	1.4	0.0	0.0
Villeneuve	3	2.4	3.3	0.0
Wells	20	4.5	19.0	6.0
Temagami District				
Coleman	5	3.1	0.7	0.0
Wawa District				
Esquega	487	2.4	0.0	0.0
Knowles	70	2.7	1.6	0.0
Maness	300	3.5	3.0	0.0
Nadjiwon	50	1.5	0.0	0.0
Vasiloff	50	2.0	4.6	0.7

Table 17. Damage caused by Scleroderris canker in the Northeastern Region of Ontario in 1991.

Location (Township)	Host	Estimated stand area (ha)	Average height of trees (m)	Trees affected (%)	Trees affected severely (%)
North Bay District					
Bonfield	rP	12	1.8	0.0	0.0
Mattawan	rP	8	2.2	0.0	0.0
Olrig	rP	5	2.1	35.3	0.0
Olrig	rP	5	2.8	4.7	0.0
Olrig	rP	9	2.2	2.7	0.0
Phelps	rP	10	2.5	0.0	0.0
Sault Ste. Marie District					
Smilsky	jP	4	2.5	67.0	44.6
Wawa District					
Recollet	jP	5	1.3	14.6	14.0

Table 18. Other forest diseases.

Insect	Host(s)	Remarks
Chrysomyxa ledi (Alb. & Schwein.) de Bary var. *ledi* Spruce needle rust	bS	Foliar damage averaging 45%, primarily on the lower third of the 5-m trees, occurred over an area of 0.2 ha in Aston Township, Temagami District.
Coleosporium asterum (Dietel) Sydow Pine needle rust	jP	15.3% incidence, with 5% foliar damage, occurred in a 7-ha plantation in Firstbrook Township, Temagami District. In the Hallam Township seed orchard in Espanola District, 12% of the trees were infected, with trace amounts of foliar damage.
Davisomycella ampla (J. Davis) Darker Tar spot needle cast	jP	46.7% incidence, with 24% foliar damage, was reported on trees 3.1 m in height in a 5-ha plantation in Coleman Township, Temagami District. Another plantation in Coleman Township sustained 20% foliar damage to 36% of the trees over a 20-ha area.
Gymnosporangium clavipes (Cooke & Peck) Cooke & Peck Quince rust	juniper	Heavy damage occurred along the shore of Lake Temagami in Finlayson Provincial Park, Strathcona Township, Temagami District.
Gymnosporangium cornutum Arthur ex Kern Gall rust	aMo	100% incidence, with 25% foliar damage, occurred for 5 km along Michipicoten Harbour road in Wawa District.
Gymnosporangium juniperi–virginianae Schwein. Cedar–apple rust	juniper	Low levels of infection were commonly observed on Manitoulin Island. The heaviest damage occurred in Bidwell Township, Espanola District, where 20% of the trees were infected in a 1-ha area.
Hypoxylon mammatum (Wahlenb.) P. Karsten Hypoxylon canker	tA	10% incidence occurred on 6-m trees in a 3-ha stand in Foster Township, Espanola District.
Isthmiella crepidiformis (Darker) Darker Isthmiella needle cast	bS	20 to 100% defoliation of the old foliage occurred on 3-m trees over a 1-ha area in Aston Township, Temagami District.

(cont'd)

Table 18. Other forest diseases (concl.).

Insect	Host(s)	Remarks
Lirula macrospora (Hartig) Darker Needle cast	wS	This disease caused 100% needle loss to the old foliage on two 9-m trees in the South Lorrain Township seed orchard, Temagami District.
Lophodermium piceae (Fuckel) Höhnel Spruce needle cast	wS	In the seed collection area in Best Township, Temagami District, 40% foliar damage to the old needles occurred on the 18-m trees.
Marssonina castagnei (Desm. & Mont.) Magnus Marssonina leaf spot	tA	High levels of infection (100% incidence, with 100% foliar damage) occurred on aspen regeneration at scattered points along McCormick Lake Road in Wawa District.
Mycosphaerella populicola G.E. Thompson Septoria leaf spot	bPo	Moderate levels of damage were commonly observed across the Sudbury, Espanola and North Bay districts. The heaviest damage occurred in Sisk Township, North Bay District, where 80% of the trees sustained damage to 75% of the foliage over an area of 5 ha.
Phyllosticta sphaeropsoidea Ell. & Ev. Leaf blotch	hChe	20% incidence, with moderate levels of foliar damage, occurred in a 1-ha area on Gore Bay, Manitoulin Island.
Septoria betulae Pass. Leaf spot	wB	100% incidence was observed along the Ely Road in Bright Township, Blind River District, where 100% of the foliage was damaged. Widespread foliar damage of 10 to 40% was recorded in the northern portions of the Sudbury, Espanola and North Bay districts. The highest level of infection in these districts occurred in Olinyk Township, Sudbury District, where 80% of the trees sustained damage to 40% of the foliage over a 15-ha area.
Venturia macularis (Fr.:Fr.) E. Müller & v. Arx. Shoot blight	tA	This shoot blight infected 40% of the 4-m trees in a 1.5-ha area in Shakespeare Township, Espanola District. Trace levels were observed elsewhere in the region.

ABIOTIC DAMAGE

Drought Damage

Prolonged periods of drought and severe defoliation of hardwoods by the forest tent caterpillar have commonly occurred over the past 5 years in the region. These stresses have undoubtedly taken their toll on the trees, and areas of mortality are common. Although the damage is widespread, most of the pockets of mortality are small, along ridge tops and on poor growing sites. The most commonly affected host is white birch, although red oak and, to a lesser extent, sugar maple have also declined in some areas.

The largest area of white birch mortality occurred in the Sudbury and Espanola districts. The bulk of the damage occurred in Graham, Waters, Broder, Dill, Neelon, Snider, Cleland and Dryden townships in Sudbury District. In Espanola District, mortality was commonly observed in Shakespeare, Gough and Baldwin townships. Although drought and forest tent caterpillar defoliation stressed the trees, the agent that was determined to be the final cause of the mortality was the Armillaria root rot fungus.

Extensive oak mortality was observed in the southern portion of Espanola District, particularly along the La Cloche Mountain chain; in the Long Lake area of Border Township, Sudbury District; and in Prince and MacDonald townships, Sault Ste. Marie District. Again, most of the mortality was located along rocky ridge tops.

In Blind River District, many bare tops and the occasional dead tree occurred in stands of sugar

maple and red maple (*Acer rubrum* L.). This condition was prevalent along Highway 129 in the Tunnel and Cummins lakes area, Gould Township, and north to Wakomota Lake in Casson Township. Severe leaf scorching also occurred in these areas.

Leaf Scorch

High temperatures and drying winds cause rapid loss of water, especially in exposed maple leaves. The leaf margins usually turn yellow then brown, and premature leaf drop can occur. This condition was observed on sugar maple at several locations in the Sault Ste. Marie, Blind River, Espanola and North Bay districts. In Sault Ste. Marie District, damage was observed along Highway 556 from the Island Lake area north to Beaver Falls in Deroche Township; the bulk of the damage occurred in Aweres Township and a small portion of the damage occurred in the southwestern corner of VanKoughnet Township. The incidence of affected trees averaged 75%, with up to 100% of the leaf surfaces damaged. Other areas in Sault Ste. Marie District with similar damage were in the Lonely Lake area of Meredith Township, throughout most of Aberdeen Additional and Aberdeen townships, and from Leeburn to the Dunn's Valley area in Galbraith Township.

Damage was commonly observed in small pockets of approximately 1 ha in the southern portions of the Blind River, Espanola and North Bay Districts. In the Warnock Lake area near the village of Iron Bridge in Blind River District, 50% of the trees were affected, with 100% foliar damage. In Casson and Gould townships, Blind River District, 75% of the trees were affected, with 100% foliar damage. The heaviest damage in North Bay District occurred in Blyth Township, where 90% of the trees were affected, with 40% foliar damage over an area of 10 ha.

Salt Damage

Although this condition was observed in many areas of the region, it was most noticeable in several areas of the Sault Ste. Marie and Blind River districts. Heavy salt damage occurred on mature eastern white pine and red pine in Sault Ste. Marie District along Highway 17 from the Garden River Indian Reserve to the town of Echo Bay. Average foliar damage of 50% was recorded on these 18-m trees. As a result of repeated heavy salting of the highway, mortality is occurring, particularly of roadside eastern white pine in this area. In Blind River District, foliar damage of between 30 and 50% occurred on semimature red pine on Highway 17 between the towns of Iron Bridge and Blind River. Heavy damage to roadside eastern white pine also occurred in Sudbury District along Highway 69 from the French River to the town of Estaire.

Wind Damage

On 27 June 1991, a severe thunderstorm passed through Wawa District. The strong winds that accompanied the storm uprooted trees or broke their main stems. Most of the damage occurred east of Highway 631 in Cooper Township, where approximately 650 ha of black spruce (*Picea mariana* [Mill.] B.S.P.) and trembling aspen were blown down.

Winter Drying

This condition is caused by warm, dry winds during the winter, which cause needles to lose moisture that the trees are unable to replace because the ground is frozen. These needles discolor and die. Low incidence of damage was reported across the region in 1991. However, heavy damage did occur in a red pine plantation growing on an open ridge top in Bonfield Township, North Bay District. At this location, 95% of the trees were affected, with 55% foliar damage in a 1.5-ha area. Plantations in Parkinson, Timbrell and Bouck townships of Blind River District, all of which showed moderate levels of damage in previous years, sustained no damage in 1991.

FOREST HEALTH

Acid Rain National Early Warning System (ARNEWS)

The four ARNEWS study plots established in 1984 and 1985 in the North Bay, Sault Ste. Marie, Sudbury and Wawa districts were tallied again in 1991.

In Wishart Township, Sault Ste. Marie District, no major insect defoliators were observed in the ARNEWS plot. However, 5% foliar damage was caused by a combination of secondary insects, mainly the crimson erineum mite (*Eriophyes elongatus* Hodg.) and the maple spindlegall mite (*Vasates aceris–crumena* [Riley]). Leaf scorch was present on 5% of trees in the plot, with approximately 23% foliar discoloration. At the plot in Huotari Township, Wawa District, no insect or disease problems were observed.

No major defoliators were observed in the plot at Agnew Lake in Hyman Township, Sudbury District, or the plot in Calvin Township (Samuel de Champlain Provincial Park), North Bay District. Armillaria root rot was a problem at the Agnew Lake plot, where it killed 25% of the mature white birch. At the Calvin Township plot, the bronze birch borer (*Agrilus anxius* Gory) was found damaging three of the 18 white birch in the plot. Much lower branch mortality was also observed on trembling aspen at this location.

No acid rain symptoms were observed in these plots.

Birch Health

Some 43,935 ha of birch top mortality were aerially mapped in 1989 in parts of the Sault Ste. Marie, Sudbury and Wawa districts. No special surveys were conducted in 1991, although the problem still exists. The plot established in 1989 in Bailloquet Township was retallied in 1990 and 1991. The birch leaf skeletonizer caused 25% defoliation of the trees in the plot in 1991. No major changes were observed in the extent of crown dieback (Table 19).

Maple Health

Since 1987, 42 plots have been established in the region (Fig. 8) to determine the amount of maple crown dieback and the change in dieback over time. Each plot consists of 25 mature or overmature trees selected along a 3-m-wide strip on a random azimuth. Trees were permanently numbered, heights and diameters were measured, and damage by insects, diseases and animals, as well as by abiotic conditions such as frost, were recorded.

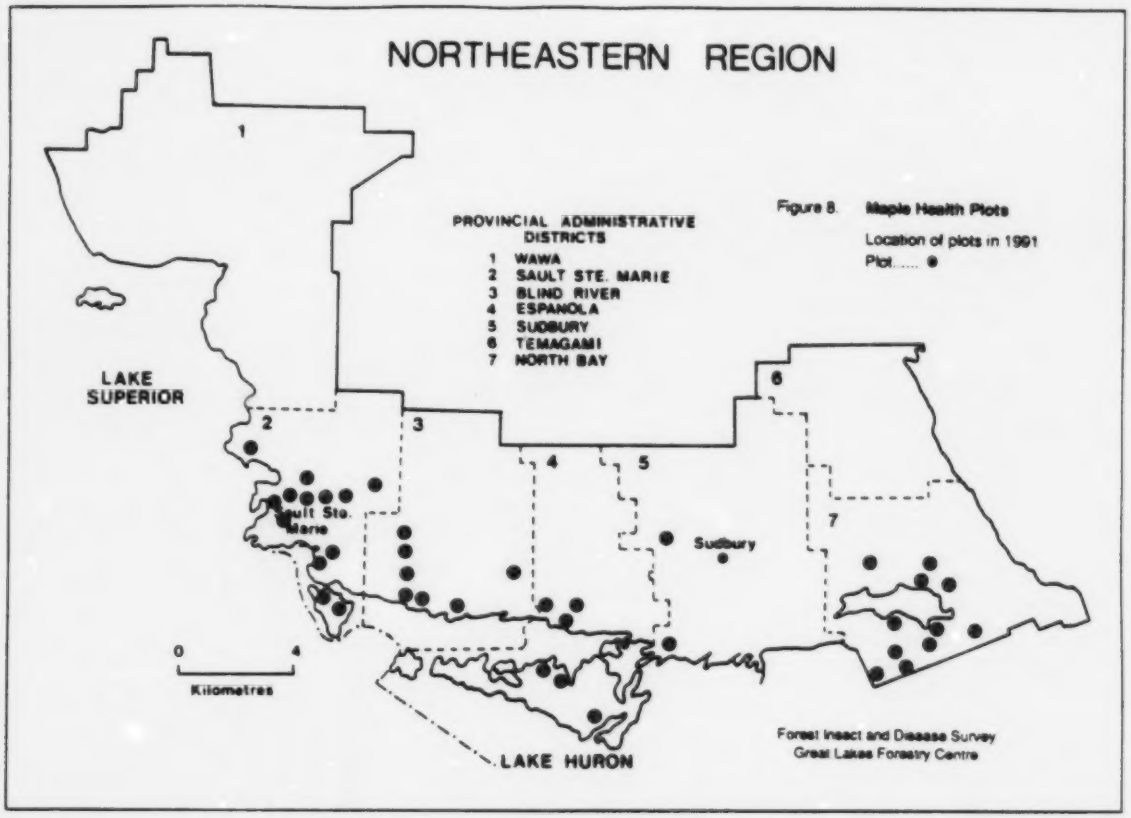
In 1991, very few plots sustained any significant amount of defoliation. The forest tent caterpillar was encountered in 7% of the plots; however, the defoliation caused by this insect was less than 10%. Eutypella canker (*Eutypella parasitica* Davidson & Lorenz.) was the most damaging disease recorded, and 3.8% of the trees were cankered. However, very little mortality has occurred and mortality is presently less than 2%.

Table 19. Birch dieback in 1989 and 1990 in the Northeastern Region of Ontario (data based on an examination of 100 host trees).

Location (Township)	Year	Current dieback class[a]						Cumulative dieback class[a]					
		0	1	2	3	4	5	0	1	2	3	4	5
		← Number of trees →											
Wawa District													
Bailloquet[b]	1989	72	26	0	0	0	2	30	39	17	4	8	2
	1990	62	34	0	0	1	3	34	34	19	2	8	3
	1991	–	–	–	–	–	–	31	43	10	2	10	4

[a] dieback classification: 0 = 0–5%, 1 = 6–20%, 2 = 21–40%, 3 = 41–60%, 4 = >61%, 5 = dead, – = measurement not taken

[b] Trees averaged 24.3 cm in DBH and 20.5 m in height.



Total dieback from 1987 to 1991 is summarized in Table 20. Figure 9 shows that the majority of trees in the region have less than 5% cumulative crown dieback since 1987. The decline in the number of trees in the 0–5% dieback class in 1989 and 1990 could be attributed to the recent infestation by the forest tent caterpillar. In 1991, 20% of the trees improved (moved into a lower dieback class), whereas 5% declined and 75% remained in the same class as in 1990.

North American Maple Project

The North American Maple Project is a co-operative agreement between the United States Forest Service and Forestry Canada. In 1988, 24 plots consisting of five 20- x 20-m subplots were established at preselected sites throughout the province. Four plots were placed in Northeastern Region, two each in sugar bushes and undisturbed woodlots. In all, 62 plots were placed across Ontario, New Brunswick, Nova Scotia and Quebec, and 103 sites were selected across seven American states. Results of dieback surveys in Northeastern Region over the past 4 years are summarized in Table 21.

Table 20. Sugar maple health in the Northeastern Region of Ontario from 1987 to 1990 (25 maples were examined at each of 42 plots).

Location (Township)	Average DBH (cm)	Average height (m)	Year	Current dieback class[a] 0	1	2	3	4	5	Cumulative dieback class[a] 0	1	2	3	4	5
				← Number of trees →											
Blind River District															
Casson	23.2	18.0	1988	25	0	0	0	0	0	24	1	0	0	0	0
			1989	24	1	0	0	0	0	22	2	1	0	0	0
			1990	24	1	0	0	0	0	24	0	1	0	0	0
			1991	–	–	–	–	–	–	25	0	0	0	0	0
Gladstone	30.6	22.8	1987	25	0	0	0	0	0	25	0	0	0	0	0
			1988	25	0	0	0	0	0	21	3	1	0	0	0
			1989	25	0	0	0	0	0	23	2	0	0	0	0
			1990	25	0	0	0	0	0	24	1	0	0	0	0
			1991	–	–	–	–	–	–	22	1	1	1	0	0
Gould	24.9	21.2	1988	25	0	0	0	0	0	18	7	0	0	0	0
			1989	25	0	0	0	0	0	18	7	0	0	0	0
			1990	24	1	0	0	0	0	21	4	0	0	0	0
			1991	–	–	–	–	–	–	25	0	0	0	0	0
Gunterman	23.2	20.8	1988	24	1	0	0	0	0	22	2	1	0	0	0
			1989	24	1	0	0	0	0	23	1	1	0	0	0
			1990	25	0	0	0	0	0	23	2	0	0	0	0
			1991	–	–	–	–	–	–	21	3	1	0	0	0
Scarfe	18.4	18.8	1988	25	0	0	0	0	0	24	1	0	0	0	0
			1989	25	0	0	0	0	0	22	3	0	0	0	0
			1990	25	0	0	0	0	0	23	2	0	0	0	0
			1991	–	–	–	–	–	–	20	3	2	0	0	0
Thessalon	22.0	20.7	1987	25	0	0	0	0	0	25	0	0	0	0	0
			1988	25	0	0	0	0	0	22	3	0	0	0	0
			1989	25	0	0	0	0	0	22	3	0	0	0	0
			1990	25	0	0	0	0	0	23	2	0	0	0	0
			1991	–	–	–	–	–	–	25	0	0	0	0	0
Wells	24.5	21.7	1987	24	0	0	1	0	0	24	0	0	1	0	0
			1988	24	1	0	0	0	0	22	2	1	0	0	0
			1989	24	0	1	0	0	0	20	4	1	0	0	0
			1990	25	0	0	0	0	0	22	3	0	0	0	0
			1991	–	–	–	–	–	–	25	0	0	0	0	0
Espanola District															
Allan	28.0	20.8	1989	17	8	0	0	0	0	8	12	4	1	0	0
			1990	17	8	0	0	0	0	6	13	5	1	0	0
			1991	–	–	–	–	–	–	13	9	4	0	0	0
Billings	18.5	15.4	1987	25	0	0	0	0	0	24	1	0	0	0	0
			1988	25	0	0	0	0	0	22	3	0	0	0	0
			1989	20	5	0	0	0	0	16	8	1	0	0	0
			1990	21	4	0	0	0	0	16	8	1	0	0	0
			1991	–	–	–	–	–	–	24	1	0	0	0	0
Gough	23.3	16.1	1987	25	0	0	0	0	0	24	1	0	0	0	0
			1988	22	3	0	0	0	0	21	4	0	0	0	0
			1989	18	7	0	0	0	0	8	15	2	0	0	0
			1990	20	5	0	0	0	0	6	17	2	0	0	0
			1991	–	–	–	–	–	–	17	8	0	0	0	0

(cont'd)

Table 20. Sugar maple health in the Northeastern Region of Ontario from 1987 to 1990 (25 maples were examined at each of 42 plots) (cont'd).

Location (Township)	Average DBH (cm)	Average height (m)	Year	Current dieback class[a] 0	1	2	3	4	5	Cumulative dieback class[a] 0	1	2	3	4	5
				← Number of trees →											
Espanola District (concl.)															
Shedden	33.3	20.7	1989	16	8	1	0	0	0	3	12	8	2	0	0
			1990	16	8	0	0	0	1	3	11	9	1	0	1
			1991	–	–	–	–	–	–	5	11	7	1	0	1
Spanish River Indian Reserve	21.4	16.2	1987	25	0	0	0	0	0	25	0	0	0	0	0
			1988	23	2	0	0	0	0	23	2	0	0	0	0
			1989	23	2	0	0	0	0	20	5	0	0	0	0
			1990	25	0	0	0	0	0	21	4	0	0	0	0
			1991	–	–	–	–	–	–	25	0	0	0	0	0
Tehkummah	28.6	16.2	1989	20	5	0	0	0	0	13	10	1	1	0	0
			1990	19	7	0	0	0	0	12	11	1	1	0	0
			1991	–	–	–	–	–	–	14	9	1	0	0	1
North Bay District															
Blyth	18.4	13.9	1987	21	4	0	0	0	0	17	2	3	3	0	0
			1988	15	10	0	0	0	0	14	5	4	2	0	0
			1989	20	3	1	0	1	0	15	7	2	0	1	0
			1990	16	7	0	0	1	1	10	11	2	0	1	1
			1991	–	–	–	–	–	–	14	8	1	0	0	2
Chisholm	23.7	17.6	1989	25	0	0	0	0	0	25	0	0	0	0	0
			1990	24	1	0	0	0	0	24	1	0	0	0	0
			1991	–	–	–	–	–	–	24	1	0	0	0	0
Commanda	22.8	16.0	1989	23	2	0	0	0	0	18	7	0	0	0	0
			1990	25	0	0	0	0	0	16	9	0	0	0	0
			1991	–	–	–	–	–	–	24	1	0	0	0	0
East Mills	21.2	15.0	1989	17	8	0	0	0	0	9	13	3	0	0	0
			1990	14	11	0	0	0	0	6	11	7	1	0	0
			1991	–	–	–	–	–	–	12	8	4	1	0	0
French	16.3	13.9	1987	22	3	0	0	0	0	19	6	0	0	0	0
			1988	23	2	0	0	0	0	13	6	5	1	0	0
			1989	17	7	1	0	0	0	12	8	3	2	0	0
			1990	18	7	0	0	0	0	11	10	1	3	0	0
			1991	–	–	–	–	–	–	13	9	1	2	0	0
Nipissing	22.0	16.1	1987	25	0	0	0	0	0	23	2	0	0	0	0
			1988	13	2	0	0	0	0	21	4	0	0	0	0
			1989	18	7	0	0	0	0	11	12	1	0	1	0
			1990	20	5	0	0	0	0	11	10	2	1	1	0
			1991	–	–	–	–	–	–	18	4	1	0	0	2
Nipissing	20.6	16.6	1989	24	1	0	0	0	0	17	9	0	0	0	0
			1990	22	3	0	0	0	0	16	9	0	0	0	0
			1991	–	–	–	–	–	–	24	1	0	0	0	0
Patterson	18.3	16.0	1987	25	0	0	0	0	0	20	4	0	1	0	0
			1988	21	4	0	0	0	0	20	4	1	0	0	0
			1989	22	3	0	0	0	0	13	11	1	0	0	0
			1990	23	1	1	0	0	0	11	11	1	0	2	0
			1991	–	–	–	–	–	–	19	4	0	0	2	0

(cont'd)

Table 20. Sugar maple health in the Northeastern Region of Ontario from 1987 to 1990 (25 maples were examined at each of 42 plots) (cont'd).

Location (Township)	Average DBH (cm)	Average height (m)	Year	Current dieback class[a] 0	1	2	3	4	5	Cumulative dieback class[a] 0	1	2	3	4	5
				Number of trees											
North Bay District (concl.)															
Pringle	22.5	15.6	1989	24	1	0	0	0	0	19	6	0	0	0	0
			1990	22	3	0	0	0	0	18	7	0	0	0	0
			1991	–	–	–	–	–	–	24	0	1	0	0	0
Pringle	22.3	15.7	1987	25	0	0	0	0	0	21	4	0	0	0	0
			1988	20	5	0	0	0	0	16	9	0	0	0	0
			1989	23	1	1	0	0	0	14	10	0	1	0	0
			1990	23	2	0	0	0	0	14	10	0	1	0	0
			1991	–	–	–	–	–	–	100	0	0	0	0	0
Widdifield	31.1	18.6	1989	16	9	0	0	0	0	7	14	4	0	0	0
			1990	19	6	0	0	0	0	7	13	5	0	0	0
			1991	–	–	–	–	–	–	17	7	1	0	0	0
Sault Ste. Marie District															
Aweres	27.3	20.9	1987	18	7	0	0	0	0	18	7	0	0	0	0
			1988	21	4	0	0	0	0	12	12	1	0	0	0
			1989	24	1	0	0	0	0	9	16	0	0	0	0
			1990	22	3	0	0	0	0	11	14	0	0	0	0
			1991	–	–	–	–	–	–	15	10	0	0	0	0
Deroche	18.4	22.0	1987	20	5	0	0	0	0	20	5	0	0	0	0
			1988	25	0	0	0	0	0	17	7	1	0	0	0
			1989	25	0	0	0	0	0	21	3	1	0	0	0
			1990	25	0	0	0	0	0	24	1	0	0	0	0
			1991	–	–	–	–	–	–	19	6	0	0	0	0
Fenwick	23.1	21.3	1987	21	4	0	0	0	0	21	4	0	0	0	0
			1988	25	0	0	0	0	0	22	3	0	0	0	0
			1989	22	3	0	0	0	0	13	10	2	0	0	0
			1990	24	1	0	0	0	0	21	3	1	0	0	0
			1991	–	–	–	–	–	–	19	5	0	0	1	0
Hilton	23.0	22.0	1987	18	7	0	0	0	0	18	7	0	0	0	0
			1988	21	4	0	0	0	0	19	6	0	0	0	0
			1989	22	3	0	0	0	0	22	3	0	0	0	0
			1990	24	1	0	0	0	0	24	1	0	0	0	0
			1991	–	–	–	–	–	–	23	2	0	0	0	0
Hodgins	24.5	22.2	1987	18	0	3	4	0	0	18	0	3	4	0	0
			1988	20	4	1	0	0	0	15	6	2	2	0	0
			1989	17	6	2	0	0	0	13	8	3	1	0	0
			1990	20	4	0	0	0	1	18	5	1	0	0	1
			1991	–	–	–	–	–	–	20	3	1	0	0	1
Jocelyn	33.5	23.0	1988	24	1	0	0	0	0	22	2	1	0	0	0
			1989	24	1	0	0	0	0	22	3	0	0	0	0
			1990	24	1	0	0	0	0	17	8	0	0	0	0
			1991	–	–	–	–	–	–	18	7	0	0	0	0
Jollineau	25.8	19.7	1988	23	2	0	0	0	0	13	10	1	1	0	0
			1989	20	4	1	0	0	0	13	7	4	1	0	0
			1990	20	4	1	0	0	0	13	9	2	1	0	0
			1991	–	–	–	–	–	–	16	7	1	1	0	0

(cont'd)

Table 20. Sugar maple health in the Northeastern Region of Ontario from 1987 to 1990 (25 maples were examined at each of 42 plots) (concl.).

Location (Township)	Average DBH (cm)	Average height (m)	Year	Current dieback class[a] 0	1	2	3	4	5	Cumulative dieback class[a] 0	1	2	3	4	5
				← Number of trees →											
Sault Ste. Marie District (concl.)															
Laird	23.9	21.3	1987	24	1	0	0	0	0	24	1	0	0	0	0
			1988	22	3	0	0	0	0	14	5	5	1	0	0
			1989	25	0	0	0	0	0	16	9	0	0	0	0
			1990	25	0	0	0	0	0	14	10	0	1	0	0
			1991	–	–	–	–	–	–	20	4	1	0	0	0
Meredith	35.0	20.3	1987	15	0	5	4	0	1	15	0	5	4	0	1
			1988	24	0	0	0	0	1	13	5	5	1	0	1
			1989	22	2	0	0	0	1	14	7	3	0	0	1
			1990	21	3	0	0	0	1	16	6	2	0	0	1
			1991	–	–	–	–	–	–	13	8	3	0	0	1
Palmer	32.0	21.3	1988	24	1	0	0	0	0	17	7	1	0	0	0
			1989	25	0	0	0	0	0	20	5	0	0	0	0
			1990	25	0	0	0	0	0	20	5	0	0	0	0
			1991	–	–	–	–	–	–	19	6	0	0	0	0
Shield	26.0	21.4	1988	22	2	1	0	0	0	15	6	3	1	0	0
			1989	25	0	0	0	0	0	20	5	0	0	0	0
			1990	24	1	0	0	0	0	19	5	0	0	0	1
			1991	–	–	–	–	–	–	23	1	0	0	0	1
VanKoughnet	20.8	20.1	1988	25	0	0	0	0	0	21	4	0	0	0	0
			1989	24	0	0	0	0	1	23	1	0	0	0	1
			1990	23	1	0	0	0	1	23	0	1	0	0	1
			1991	–	–	–	–	–	–	20	2	1	1	0	1
Whitman	26.5	21.0	1988	23	1	1	0	0	0	16	7	1	1	0	0
			1989	20	3	1	1	0	0	14	9	0	2	0	0
			1990	23	1	0	0	0	1	18	5	0	1	0	1
			1991	–	–	–	–	–	–	20	2	1	1	0	1
Sudbury District															
Cascaden	16.9	12.9	1987	24	1	0	0	0	0	20	5	0	0	0	0
			1988	22	3	0	0	0	0	22	3	0	0	0	0
			1989	19	6	0	0	0	0	12	8	3	0	0	1
			1990	19	5	0	0	0	1	10	10	4	0	0	1
			1991	–	–	–	–	–	–	17	4	1	2	0	1
Killarney	21.0	14.6	1987	24	1	0	0	0	0	20	1	0	1	0	0
			1988	24	1	0	0	0	0	23	1	0	1	0	0
			1989	23	2	0	0	0	0	18	6	1	0	0	0
			1990	21	4	0	0	0	0	16	8	1	0	0	0
			1991	–	–	–	–	–	–	23	2	0	0	0	0

[a] dieback classification: 0 = 0–5%, 1 = 6–20%, 2 = 21–40%, 3 = 41–60%, 4 = >61%, 5 = dead tree, – = measurement not taken. No trees had been blown down or cut in any of the plots.

Table 21. Crown condition of sugar maple at four North American Maple Project plots in the Northeastern Region of Ontario from 1988 to 1990.

Location (Township)	Average DBH (cm)	Year	Number of trees examined	Total dead crown (%)										Trees dead	Trees blown down or cut
				0	1–5	6–15	16–25	26–35	36–45	46–55	56–65	66–75	76–100		
				← Number of trees →											
North Bay District															
Nipissing[b]	19.6	1988	113	56	39	13	3	1	1	0	0	0	0	0	0
		1989	113	20	69	16	6	2	0	0	0	0	0	0	0
		1990	113	0	102	7	2	1	1	0	0	0	0	0	0
		1991	112	0	101	7	1	2	1	0	0	0	0	1	0
Patterson[a]	19.6	1988	65	23	29	7	5	0	0	0	1	0	0	0	0
		1989	65	22	23	16	3	0	0	0	0	1	0	0	0
		1990	64	0	62	2	0	0	0	0	0	0	0	1	0
		1991	64	0	61	1	1	1	0	0	0	0	0	1	0
Sault Ste. Marie District															
Wishart[a]	27.6	1988	74	27	21	10	11	4	0	0	0	1	0	0	0
		1989	72	19	31	14	4	3	0	0	1	0	0	1	1
		1990	72	0	49	12	5	5	0	0	1	0	0	1	1
		1991	71	0	53	7	6	4	0	0	1	0	0	2	1
Tarentorus[b]	24.4	1988	84	8	57	16	2	1	0	0	0	0	0	0	0
		1989	82	3	31	27	19	0	0	1	0	0	0	0	2
		1990	81	0	63	11	6	1	0	0	0	0	0	1	2
		1991	81	0	71	10	0	0	0	0	0	0	0	1	2

[a] undisturbed woodlot

[b] trees currently tapped for maple syrup

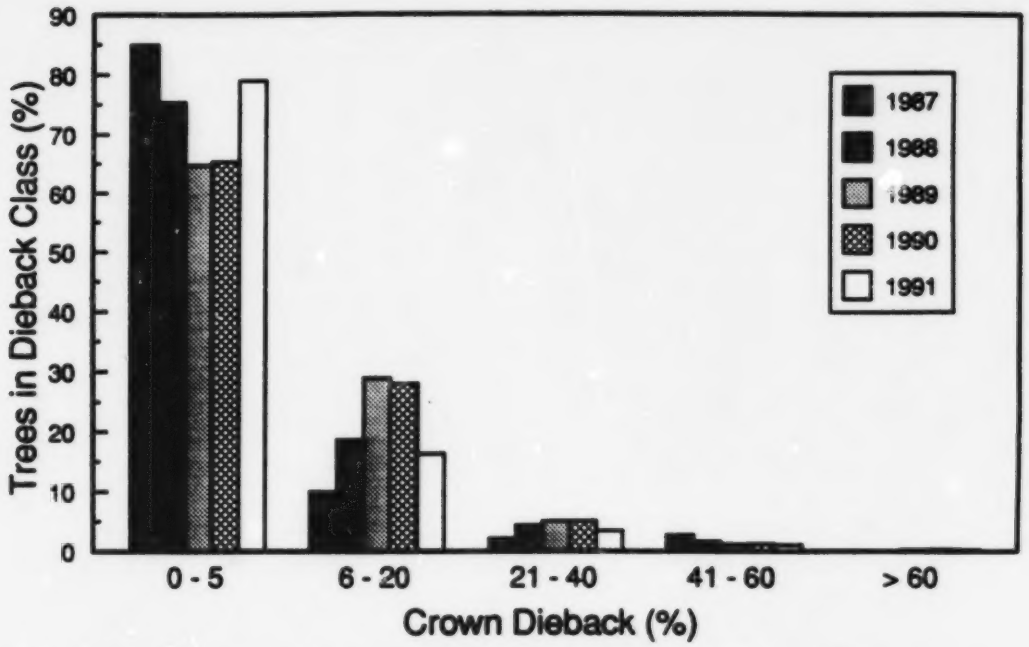


Figure 9. Summary of the sugar maple dieback in the Northeastern Region of Ontario from 1987 to 1991.

SPECIAL SURVEYS

Seed Orchard Survey

In 1990 a special survey was conducted at the request of OMNR in Northeastern Region to develop an inventory of disease and insect problems in seed orchards. In 1991, the survey was continued and the results are shown in Tables 22 and 23. Two jack pine seed orchards were surveyed, one in Hallam Township, Espanola District, and the other in Lumsden Township, Sudbury District. A single eastern white pine seed orchard was surveyed in Mattawan Township, North Bay District.

The organisms that caused the most damage to the jack pine seed orchards were the white pine weevil and the eastern pine shoot borer. The white pine weevil killed 7.3% of the leaders in the Lumsden Township seed orchard and the eastern pine shoot borer attacked 4.7% of the leaders in the Hallam Township seed orchard.

Few pests were found in the Gurd Township seed orchard. The organism that caused the most damage was the white pine weevil, which killed 4.7% of the leaders.

Thessalon Tree Nursery

Surveys conducted in the Thessalon Tree Nursery revealed no major losses to seedlings caused by insects or diseases, although some insect activity caused some concern for OMNR nursery staff.

Large numbers of the black cutworm (*Agrotis ipsilon* [Hufn.]) were found in the rising 1.0 red pine seedlings, with approximately three larvae per square metre occurring. The variegated cutworm (*Peridroma saucia* [Hbn.]) was also found, but to a lesser extent. Control measures were conducted to prevent serious losses, and results were good. The lygus bug (*Lygus sp.*) was collected on sticky traps placed by OMNR staff. Damage was present on the white pine transplants; however, damage was old, and the overall pattern of browning, curled needles and necrotic tissue suggested that not all damage was caused by this insect. On the black locust (*Robinia pseudoacacia* L.) seedlings, large numbers of the low-pea aphid (*Aphis craccivora* Koch.) occurred; however, the seedlings were sprayed with Malathion and only light damage occurred. No diseases were encountered within the nursery compartments.

Table 22. Damage in two jack pine seed orchards in the Northeastern Region of Ontario in 1991 (results based on an examination of 150 randomly selected trees at each location).

	Espanola	Sudbury
	Hallam Township	Lumsden Township
Average height (m)	2.8	2.2
Area (ha)	25	10
Density (trees/ha)	2,400	2,500
Jack pine budworm – trees affected (%)	0	0
Jack pine sawflies – trees affected (%)	0	0.7
White pine weevil – leaders affected (%)	2.7	7.3
Pine shoot borer – laterals affected (%)	16.7	6.0
– leaders affected (%)	14.0	7.3
Jack pine tip beetle – leaders affected	0.7	2.0
Swaine sawfly – trees affected (%)	0	0
Pine spittlebug – trees affected (%)	0	0
Needle rust – trees affected (%)	12.0	0
Needle cast – trees affected (%)	0	24.0
Armillaria root rot – trees affected (%)	0.7	1.3
Scleroderris canker – Trees affected (%)	0	0
Western gall rust – trees affected (%)	0	0
Stem rust – trees affected (%)	0	0

Table 23. Damage in one eastern white pine seed orchard in the Northeastern Region of Ontario in 1991 (results based on an examination of 150 randomly selected trees at each location).

	North Bay
	Gurd Township
Average height (m)	7.1
Area (ha)	25
Density (trees/ha)	1,700
White pine weevil – leaders affected (%)	4.7
Pine shoot borer – leaders affected (%)	1.3
Pine bark adelgid – trees affected	0
Pine sawflies – trees affected (%)	0
Pine spittlebug – trees affected (%)	0
White pine blister rust – trees affected (%)	1.3
– stem cankers (%)	0.7
Basal stem cankers – trees affected (%)	2.7
Armillaria root rot – trees affected (%)	0
Needle rust – trees affected (%)	0
Needle cast – trees affected (%)	0

In an eastern white pine breeding orchard within the nursery, approximately 20% of the 1.5-m grafted white pine stock were infested with the white pine aphid (*Cinara strobi* [Fitch]); however, no damage was observed. In the same plantation, an occasional tree had signs of old blister rust infections on the lower lateral branches, but at trace levels, with no mortality. *Armillaria ostoyae* was also observed affecting about 2% of the trees.

In areas adjacent to and on the perimeter of the nursery, trace defoliation by the European pine sawfly occurred on Scots pine trees. An occasional larva of the introduced pine sawfly (*Diprion similis* [Htg.]) was also found on white pine trees, but again, no significant defoliation was observed. Other insects encountered at trace levels were the white pine weevil, the eastern pine shoot borer and the yellowheaded spruce sawfly.

Mechanical and chemical damage were also observed at scattered points throughout the nursery, but damage was very light.

Climatic Data

Environmental factors such as temperature and precipitation play an important role in the development of insects and diseases and in tree growth in the forest. Certain weather conditions can predispose the forest to damage, and can be the cause of marked fluctuations in insect populations or in the incidence of disease. Adverse weather conditions cause abiotic damage such as frost; winter drying or leaf scorch; breakage as a result of wind, snow or hail damage; and drought. Weather

data for three locations across the region are recorded in Table 24. This table includes the monthly mean temperatures, total precipitation values for 1991, and the deviations of both parameters from 30-year normals. More detailed weather information can be obtained from local Atmospheric Environment Service weather offices.

Table 24. Mean temperatures and total precipitation at three locations in the Northeastern Region of Ontario in 1991.

Location	Month	Mean temperature (°C)		Deviation from normal	Total precipitation (mm)		Deviation from normal
		Actual	Normal	(°C)	Actual	Normal	(%)
Sault Ste. Marie Airport	January	-10.1	-10.9	-0.8	74.0	40.9	-33.1
	February	-10.0	-7.2	+2.8	68.0	21.9	-46.1
	March	-5.1	-3.5	+1.6	60.4	90.4	+30.0
	April	3.1	5.4	+2.3	64.4	91.6	+27.2
	May	9.1	12.1	+3.0	84.2	37.0	-47.2
	June	14.6	16.6	+2.0	74.3	27.8	-46.5
	July	17.3	17.5	+0.2	55.6	79.8	+24.2
	August	16.9	18.7	+1.8	82.7	43.0	-39.7
	September	12.8	12.1	-0.7	95.3	137.9	+42.6
	October	7.6	7.0	-0.6	74.2	84.1	+9.9
	November	0.7	0.1	-0.6	85.7	81.7	-4.0
	December	-6.7	-6.1	+0.6	79.6	58.0	-21.6
Sudbury Airport	January	-13.7	-13.2	+0.5	57.5	50.0	-7.5
	February	-12.5	-9.1	+3.4	47.0	35.2	-11.8
	March	-6.0	-4.0	+2.0	55.2	120.4	+65.2
	April	2.7	5.3	+2.6	61.1	72.0	+10.9
	May	10.5	13.3	+2.8	67.1	72.6	+5.5
	June	16.0	18.3	+2.3	82.8	22.5	-60.3
	July	18.7	19.5	+0.8	83.1	109.8	+26.7
	August	17.3	18.9	+1.6	82.9	61.1	-21.8
	September	12.2	11.4	-0.8	106.5	117.5	+11.0
	October	6.3	6.0	-0.3	74.6	158.9	+84.3
	November	-1.2	-1.3	-0.1	77.8	58.7	-19.1
	December	-10.2	-9.5	+0.7	65.8	73.5	+7.7
North Bay Airport	January	-13.0	-12.8	+0.2	63.5	60.4	-3.1
	February	-11.3	-8.3	+3.0	56.2	46.2	-10.0
	March	-5.3	-3.4	+0.9	61.1	100.0	+38.9
	April	3.2	6.0	+2.8	62.3	91.6	+29.3
	May	10.6	13.3	+2.7	69.3	88.0	+18.7
	June	15.7	17.8	+2.1	85.1	32.4	-52.7
	July	18.3	19.5	+1.2	102.4	122.8	+20.4
	August	17.0	18.4	+1.4	98.7	61.1	-37.6
	September	12.2	11.1	-1.1	115.9	112.0	-3.9
	October	6.4	6.3	-0.1	87.7	155.5	+67.8
	November	-1.0	-1.3	-0.3	86.6	91.4	+4.8
	December	-9.7	-9.3	+0.7	75.4	72.9	-2.5